GOLD

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Cover:
A standard gold bullion bar is now worth about two hundred thousand dollars.

NOTE:
This background discussion paper does not represent official policy and the views expressed herein are not necessarily the viewpoint of the Government of Ontario.

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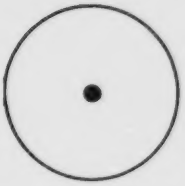
GOLD



Ontario Mineral Policy Background Paper No. 12

THOMAS PATRICK MOHIDE

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Ontario Ministry of Natural Resources

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GOLD IN CANADA

CANADA—MAIN GOLD PRODUCERS
(numbers refer to numbers on map)

Newfoundland
1) Consolidated Rambler Mines Limited (a)*
2) ASARCO Incorporated (Buchans Unit) (a)

New Brunswick
3) Heath Steele Mines Limited (a)

Quebec
4) Gaspé Copper Mines Limited (a)
5) Sullivan Mining Group Ltd. (a)
6) Chibougamau district
   Campbell Chibougamau Mines Ltd. (a)
   Falconbridge Copper Limited (Opemiska Division) (a)
   Patino Mines (Quebec) Limited (Copper Rand Division) (a)
7) Noranda-Rouyn district
   Falconbridge Copper Limited (Lake Dufault Division) (a)

   Malartic—Val d'Or district
   Camflo Mines Limited (b)
   East Malartic Mines Limited (b)
   Lamaque Mining Company Limited (b)
   Louvem Mining Company Inc. (a)
   Sigma Mines (Quebec) Limited (b)
8) Matagami district
   Agnico-Eagle Mines Limited (b)
   Mattagami Lake Mines Limited (a)
   Orchan Mines Limited (a)

Ontario
9) KERR ADDISION MINES LIMITED (b)
   Pamour Porcupine Mines, Limited (Ross mine) (b)
   WILLROY MINES LIMITED (MACASSA DIVISION) (b)
10) DOME MINES LIMITED (b)
   PAMOUR PORCUPINE MINES, LIMITED (NOS. 1, and 3 MINES AND TIMMINS PROPERTY (b)
   Pamour Porcupine Mines, Limited (Schumacher Division, McIntyre mine) (a&b)
11) INCO LIMITED (a)
   Falconbridge Nickel Mines Limited (a)
12) Noranda Mines Limited (Geco Mine) (a)
13) Mattabi Mines (a)
14) CAMPBELL RED LAKE MINES LIMITED (b)
   DICKENSON MINES LIMITED (b)
   Robin Red Lake Mines Limited (b)

Manitoba
15) Hudson Bay Mining and Smelting Co., Limited (Flin Flon) (a)
16) Hudson Bay Mining and Smelting Co., Limited (Snow Lake) (a)
17) Sherritt Gordon Mines Limited (Fox Lake & Ruttan mines) (a)
18) Inco Limited (a)

Saskatchewan
15) Hudson Bay Mining and Smelting Co., Limited (a)

British Columbia
19) Cominco Ltd. (a)
20) Granby Mining Corporation (Phoenix Division) (a)
21) Brenda Mines Ltd. (a)
   Similkameen Mining Company Limited (a)
22) Northair Mines Ltd. (b)
23) Western Mines Limited (a)
24) Utah Mines Ltd. (Island Copper Mine) (a)
25) Small placer operations (c)
26) Granby Mining Corporation (Granisle Division) (a)
   Noranda Mines Limited (Bell Copper mine) (b)
27) Westfrob Mines Limited (a)
28) Newmont Mines Limited (a)
29) Small placer operations (c)

Yukon Territory
30) Whitehorse Copper Mines Ltd. (a)
31) Small placer operations (c)
32) Small placer operations (c)
33) Small placer operations (c)

Northwest Territories
34) Cominco Ltd. (Con mine) (b)
   Giant Yellowknife Mines Limited (b)
   Lolor Mines Limited (b)
   Rycon Mines Limited (b)
   Supercrest Mines Limited (b)

* (a) Base metal; (b) Auriferous quartz; (c) Placer

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NOTE OF EXPLANATION: METRIC CONVERSION

Much of the data contained in this report is in converted metric units as recommended by the Ontario Interministerial Committee on National Standards and Specifications (Metric Committee). The tonne, commonly called metric ton (1 t = 1000 kg), is used throughout the text unless otherwise noted. Recommended conversion is 1 ton (short: 2000 lb) = 907.184 74 kg and 1 ton (long: 2240 lb) = 1016.046 908 8 kg.

1 billion in this paper represents 1,000 million.

Sources

INFORMATION AND DATA ON GOLD CONSUMPTION AND SOME MINE AND REFINERY PRODUCTION DETAILS ARE SOMEWHAT DIFFICULT TO OBTAIN.

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Mineral Policy Sector, Department of Energy, Mines and Resources of the Government of Canada, Ottawa, Ontario
Department of External Affairs of the Government of Canada, Ottawa, Ontario
Department of Finance of the Government of Canada, Ottawa, Ontario
Royal Mint, London, U.K.
Bureau of the Mint, U.S. Government
Bureau of Mines, U.S. Government
Government of the Republic of South Africa
Dome Mines, Ontario
Campbell Red Lake Mines, Ontario
Pamour Mines, Ontario
Kerr Addison, Ontario
Dickenson Mines, Ontario
INCO Metals Co. Division of INCO Ltd., Toronto, Ontario
Johnson Matthey, Toronto and Brampton, Ontario
Johnson Matthey, U.K.
Johnson Matthey, U.S.A.
Degussa, Canada
Engelhard Industries, Aurora, Ontario
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Foreword

This report, "Gold", is the twelfth basic reference publication in a series of studies prepared by the staff of the Mineral Resources Branch, Mineral Resources Group, Ontario Ministry of Natural Resources. The series has grown out of the recognition that each of the major metal commodities produced in Ontario is a unique entity with special characteristics in a worldwide market. Gold is among the most important minerals mined in Ontario, in terms of aggregate value.

This book is not directed at a highly technical audience, but rather it is aimed at providing a comprehensive picture for those people who from time to time would like to know more about this very important and glamorous precious metal in a handy form.

Canada is the world's third largest source of gold and Ontario mines far more gold than any other Province. Gold is an important byproduct of the Sudbury, Ontario nickel-copper mines of Inco and Falconbridge.

Traditionally, gold has been associated with the good things of life—splendour, high adventure, celebrations, some religions, great art, beauty, joy, the desire for wealth, prosperity, peace—all that is good and beautiful. That is the context in which gold belongs, where its value can best be understood and appreciated.

The allure of gold is undeniable. Most people prefer gold in jewellery because it

1) is rare and has always bestowed a certain cachet on its owner.

2) has Beauty—gold has a colour and a lustre unattainable in other material. Copper is the only other metallic element that has a colour. All other metals (elements) are "grey."

3) is obtained and worked with comparative ease.

4) has Permanence—its resistance to decay must have given gold a supernatural quality from the earliest times. It neither corrodes nor tarnishes.

5) has Convertibility. If hard times come, the owner of gold can always melt it down and this still happens frequently in the East, e.g. the "boat people" of Vietnam. It saved their lives.

People invest in gold in bullion or coin form, all over the world, even where it is illegal to do so.

This story spans the compulsion of the search for gold in the story of the Golden Fleece, the wealth of Croesus, the high promise of the Klondike, Canada in 1896 and the gold booms in Northern Ontario, one in the 1930's and again in 1980.

THE BOOK OPENS BY PROVIDING, WITHOUT BEING TOO TECHNICAL, A COMPREHENSIVE REVIEW OF GOLD WITH A LOOK AT INDIVIDUAL USES, MINE OUTPUT, ETC. THIS MEANS THAT THE INFORMATION ON THE METAL IS SELF-CONTAINED, ELIMINATING THE LOSS OF TIME INVOLVED IN REFERENCE HUNTING. THIS STUDY CLOSES WITH AN EXECUTIVE SUMMARY AND RECOMMENDATIONS AND HOPEFULLY HELP TO STIMULATE AND ACCELERATE BOTH ONGOING OUTPUT AND THE FUTURE SEARCH FOR NEW DEPOSITS, PARTICULARLY IN ONTARIO, THE SOURCE OF SO MUCH GOLD TO DATE.

Gold is the "fuel" on which the speculative fever in exploration depends for "heat". No other commodity excites so much enthusiasm in the speculator, the mining executive or the prospector.

Because of its relatively simple metallurgy, it is possible for the individual to imagine that he can develop his property himself and repeat the saga of Harry Oakes. This is part of the attraction, but especially important is the unique way that "Gold" excites—by its sheen or by its weight, no one knows. What we do know is that gold at the "right price" creates an interest in mineral exploration more affective than any government policy or program ever devised. We also know that gold exploration efforts invariably lead to the discovery and development of other minerals. We hope that the current interest in gold in Ontario heralds the beginning of another whole era of exploration and mineral development in Northern Ontario and Canada!

This book is dedicated to that ambition.

G. A. Jewett
Executive Coordinator
Mineral Resources Group
Ministry of Natural Resources

Chapter 1

The 8 Precious Metals—Also Called the Noble Metals

("METAUX PRECIEUX" IN FRENCH; "EDELMETALLE" IN GERMAN; "METALLI PREZIOSI" IN ITALIAN.)

Precious (or noble) metals are so called because they withstand severe heat and corrosive environments, resisting oxidation in air or water and resisting acid solutions, i.e. a reluctance to dissolve in media that will corrode almost any base metal. Nobility can be defined as an ability to remain unchanged in various environments.

TWO OF THE SIX PLATINUM GROUP METALS ARE USUALLY MUCH MORE EXPENSIVE THAN GOLD—RHODIUM, (TWICE AS EXPENSIVE), AND PLATINUM ITSELF.

It is very unlikely that new substitutes will be found for many of the wide ranging applications which utilize the precious metals, including gold.

It is very unlikely that new substitutes will be found for many of the wide ranging applications which utilize the precious metals, including gold.

THE 8 PRECIOUS METALS COMPRISE:

a) *The two Ancient Precious Metals*

Gold
Silver

b) *The six modern Platinum Group Metals, (P.G.M.'s or the Platinoids)*

Platinum	Palladium
Iridium	Rhodium
Osmium	Ruthenium

1.1 PART OF THE PERIODIC TABLE OF ELEMENTS

Fe 26	Co 27	Ni 28	Cu 29
Ru 44	Rh 45	Pd 46	Ag 47
Os 76	Ir 77	Pt 78	Au 79

Ag	Silver	Co	Cobalt
Au	GOLD	Cu	Copper
		Fe	Iron
Ir	Iridium	Ni	Nickel
Os	Osmium		
Pd	Palladium		
Pt	Platinum		
Rh	Rhodium		
Ru	Ruthenium		

The figures are their atomic numbers.

Chapter 2 Gold

Gold is fascinating. It is the most romantic of all metals. It receives affection and attention to a degree that borders on worship. Great is the mystique of gold. A yearning for gold appears to be ingrained in the human psyche.

It is a word built into the very language of our Judaeo-Christian culture and that of India, Islam and South East Asia.

Gold has enthralled man since the dawn of civilization. Gold was almost certainly the first metal to attract the attention of man, because of the dazzle and allure of its brilliant appearance, its unalterability by corrosion—freedom from corruption—and its occurrence in the native condition in the ground. The first two metals that man was able to melt and work were copper and gold.

Throughout history, gold has been a lodestone drawing men into remote spots in the hope of wealth.

The Northern Europeans, the Mesopotamians, the Irish, the Scythians, the Persians, the Greeks, the Carthaginians and the Romans each in turn exploited the gold ore reserves of Europe, the Mediterranean and the Middle East before Christ in their desire for the lustrous yellow metal which made their rulers beautiful, wealthy and powerful. Some of their beautiful gold pieces can still be seen on display in the great museums.

Mankind has had a very special relationship with gold for thousands of years. It will probably continue and more and more want to own some of it. Perhaps the last remnant of the ancient belief that certain substances impart desirable characteristics to man if they are eaten is a famous drink—Danziger Goldwasser—an aromatic liqueur in which tiny specks of gold leaf are suspended, which is given its taste by citrus rinds and herbs.

Gold is not a scarce strategic metal, but it does have vital uses in industrial and military equipment. However, in a really desperate situation, there would always be enough on-surface products such as jewellery that could be obtained and melted down for emergency use in most industrialized countries. In the Liberation Wars of Prussia against Napoleon in the early 1800's, people were encouraged to turn in golden wedding rings for iron ones, which were inscribed: "Gold gab ich für Eisen"—gold I gave for iron—a symbol for arms. This also happened in Italy in World War II.

It is, however, a vital monetary metal and is likely to remain so. The total amount of gold mined in the world since 3900 B.C. is estimated as only 116,000 metric tons. If this were put in one place it would comprise a cube with sides measuring only about 18 metres each.

"Gold! Gold! Gold! Gold!
Bright and yellow, hard and cold."

—Thomas Hood

2.1 THE NAME

It is a remarkable fact that Gold is still spelled exactly the same way in English as it was 13 centuries ago. The other unchanged English spellings from the seventh century A.D. are very few, e.g. winter, wind, storm, bed, nest, corn, lamb, ram, hand and blind.

The word "Gold" is common to both the ancient Germanic and Slavonic language groups. The word in German is spelled the same way. The Russian word is "zoloto". Its chemical symbol, Au, is derived from the Latin "aurum", meaning "shining dawn" and the French word is "or", the Portuguese "ouro" and the Spanish "oro", from that Latin word. It is "Oir" in Irish.

Chryso is the Greek word for gold. In English, a "chrysophile" is a lover of gold, or in modern slang, a "gold bug".

2.2 CHARACTERISTICS OF THE METAL

Gold is a bright yellow, lustrous, rather soft, noble metal with a warm surface glow that is familiar to millions. One of the first metals worked by man, it has been highly treasured and associated with the arts, ornaments and jewellery from the earliest times.

Gold occurs as the metal (native gold), auriferous sulphides and as tellurides, usually in veins of quartz and pyrite and arsenopyrite.

Gold does not deteriorate with age. It is almost indestructible—melting point 1063°C.; boiling point 2966°C. Gold is non-reactive and is unattacked by most acids and is a very valuable metallic element. Gold has an affinity for cyanide and mercury, (amalgam).

Gold is a very dense metal, (S.G. 19.32 at 20°C.), weighing more than 19 times an equivalent volume of water and higher than tungsten, (S.G. 17). Element #79 in the periodic table, gold has an atomic weight of 197.2. *A CUBIC FOOT OF GOLD WEIGHS ABOUT HALF A TON.*

Pure gold is the most malleable and ductile of all metals, a good conductor of electricity and heat. Since pure gold is soft, it scratches easily. Certain commercial qualities of gold are softer than silver under all conditions. Gold also has the ability to adhere firmly to other metals. A little gold can go a very long way indeed. To take an example of ductility, one troy ounce of gold can be drawn into wire 50 miles long. In a giant Boeing 747 jumbo jet aircraft, the microcircuits contain gold wire which is about half the thickness of a human hair.

Gold's most convenient feature is its anonymity. There is no question of it being traced, (without elaborate expense).

"Scrap" may be gold smuggled in last night, refashioned during the morning and sold to the market in the afternoon.

One ounce can be beaten into a sheet 100 feet square, or into leaves which are .0001 mm., or say, 5 millionths of an inch thick, (i.e. some 200,000 thicknesses or leaves to the inch).

When gold is beaten to leaf of a thinness of a 150,000th part of an inch, light passes through the gold leaf. If the gold is pure, it transmits green rays, that is it appears green when held up to the light. If highly alloyed with silver, it transmits pale violet rays. A gold coating of only four millionths of an inch thick helps to protect men in spacecraft from the heat from rocket engines.

When you fly in a jet aircraft, including the Concorde, remember that these aircraft have windshields impregnated with a thin layer of gold only one fifth of a millionth of an inch thick, blocking out the sun's rays and providing a medium for electrically heating, de-icing and de-misting them. The gold layer does not interfere with vision. The glass pane appears to have a brown or gold-bronze tint from the outside of the plane and looks pale blue-green from the inside. The ultra thin layer of gold also cuts down glare and the heat of the sun, but does not alter the entry of light very much. People can see out but relatively little heat will enter since it reflects much of the scorching infra red rays of the sun.

Such gold layered window glass also reduces air conditioning costs in office and other buildings in hot weather.

The new Royal Bank of Canada headquarters building on Bay Street in Toronto is an esthetically dramatic example of this. A TOTAL OF ABOUT 2,500 TROY OUNCES, (77.7 KILOS) OF PURE 24 KARAT GOLD, WORTH ABOUT ONE AND A QUARTER MILLION DOLLARS, ($1,250,000), (bought when gold was only about $100 an ounce), is in the glass of 14,000 window panes of this beautiful building. The whole building gleams in the sun like a giant block of gold.

The architects said that the saving of energy was a prime reason for choosing gold reflective insulating glass. Such windows cost two or three times the expenditure for ordinary windows, but the gold coating quickly saves more than it cost to install it. The gold laminated glass is on the outside surface of the inside panels of the double glazed windows.

Pure unadulterated gold would make a superb frying pan because it diffuses heat more evenly than iron or copper. Being chemically more stable than copper, iron or stainless steel, it is even less prone to impart a taste. Such a frying pan might weigh say 26 troy ounces. The gold it was made of would cost about U.S.$14,000 at current prices, apart from the fabricating cost.

Chapter 3 Price of Gold

GOLD—IRRESISTIBLE FOR OVER 5,000 YEARS.

3.1 PRICES—FREE MARKET GOLD

About the year 1200, financiers in Europe started to keep track of the price of gold and gold coins.

In 1717, Sir Isaac Newton, Master of the Mint in London, fixed the price of gold at 84 shillings and eleven pence half-penny per troy ounce and this price lasted for almost two centuries. The price of gold in 1914 was the same as in 1717, owing to the huge increase in gold production from the discoveries in South Africa, California, Canada and Australia.

The abandonment of the gold standard by most countries caused by the 1914-18 War was followed by erratic gold prices until order was restored by the fixing of the price at $35 by the U.S.A. in January, 1934, which lasted until the new free market opened in March, 1968.

In October, 1972 most people thought that $100 per troy ounce for gold was still far in the distant future.

After almost 800 years, the gold price, (in terms of the U.S. dollar), reached the psychological mark of U.S.$100 per troy ounce on Monday, May 14, 1973 and continued to rise.

In mid-1976 the price of gold fell back dramatically to U.S.$103 an ounce.

U.S.$200 per troy ounce was reached on Friday, July 28, 1978, only some five years after the $100 landmark.

The $300 barrier ($9.64 million per ton), was reached only one year later on July 14, 1979, U.S.$300.25 at the Winnipeg Commodity Exchange and U.S.$300 in San Francisco.

In the following months, U.S.$400 was reached, then $500 and $600—then $700 in 1980.

1980 WAS THE MOST REMARKABLE YEAR IN THE HISTORY OF GOLD.

ONTARIO HAS GREATLY BENEFITTED FROM THE GIANT LEAPS IN THE GOLD PRICE IN THAT YEAR.

The price of gold at the beginning of 1980 was U.S.$559.50 per troy ounce. It rose to a record U.S.$850 by January 21, U.S.$474 towards the end of March, 1980 and moved to $490 by May 1. The price again broke through U.S.$700 an ounce in September, 1980 for the first time since February, reaching $750.50 on September 23, up $90 in 3 weeks and then falling gradually to U.S.$526.75 by the end of the year.

The average price for 1980 is estimated as U.S.$613. Over the first half of 1980, the gold price averaged U.S.$605—almost *double* the 1979 equivalent. The gold price averaged U.S.$609 in the first nine months of 1980. The 1979 average was $250. Long term investment in gold—particularly in the U.S.A.—is needed to get back to the $800 level, but current high interest rates are inhibiting this.

(One might mention here that silver finished the year at U.S.$15.69 a troy ounce. The 1980 high was $50.35 and the low $10.20.)

Some experts believe that 1981 may be remembered as an historic trough for the gold price in real terms. If inflation accelerates in late 1981 as well as in 1982, the gold price might advance strongly in 1982 well above the U.S.$600 level in current terms.

Gold price movements are linked to certain political and economic events that influence the market. The price of gold is in fact determined in a free market influenced by a great many considerations—economic, political and cultural.

There are six major participating groups whose decisions collectively determine the market price of gold. These are: the mine producers, the industrial users, the secondary refiners, the private investors or hoarders, the speculators and the government holders. An additional major ingredient: monetary and fiscal policies of governments, (money supply and interest rates.)

Only price shifts in constant dollars are significant, at least as to their effects on production.

THE GOLD PRICE IS PARTLY A PRODUCT OF A LARGE AMOUNT OF EMOTION, e.g.

1) Fear—of a major war involving a superpower and of inflation, particularly, on the part of individuals, businesses et al.

2) Anxiety—certain people worry about the future and try to puzzle out the safest package and location for their private capital, away from tax men and war sites—increasingly this includes a percentage held in bullion gold or coins.

3) Speculation or perhaps Greed—certain people playing the market hoping to buy gold bullion cheap and sell it high.

4) Resentment—that the gold price goes down from time to time.

5) HOPE OF A BONANZA (based on reason)—INVESTORS PUT THEIR MONEY INTO MINERAL EX-

PLORATION IN A SUITABLE GEOLOGICAL AND INVESTMENT ENVIRONMENT SUCH AS ONTARIO, HOPING TO FIND A GOLD DEPOSIT. MANY FINDS IN ONTARIO WERE MADE IN 1980.

These emotions affect the market price when such persons and companies purchase gold bullion or find a new deposit of gold, (which enters the market at some time, either as a futures sale or later as a cash sale when the refined gold is poured.)

There is a counterpart fear among some people in the U.S., France etc., i.e. of confiscation of private gold. A paradox may be that gold confiscation procedures in the U.S.A. may become more likely under the Reagan Administration than under any previous government.

Equivalents

U.S.$100 per troy ounce equals	U.S.$ 3.2 million per metric ton
U.S.$200 per troy ounce equals	U.S.$ 6.4 million per metric ton
U.S.$300 per troy ounce equals	U.S.$ 9.6 million per metric ton
U.S.$400 per troy ounce equals	U.S.$12.86 million per metric ton
U.S.$500 per troy ounce equals	U.S.$16.0 million per metric ton
U.S.$600 per troy ounce equals	U.S.$19.2 million per metric ton
U.S.$650 per troy ounce equals	U.S.$20.8 million per metric ton
U.S.$700 per troy ounce equals	U.S.$22.47 million per metric ton
U.S.$800 per troy ounce equals	U.S.$25.68 million per metric ton.

PRICE-MAKING INFLUENCES IN GOLD

(Arrows Indicate Principal Causal Direction)

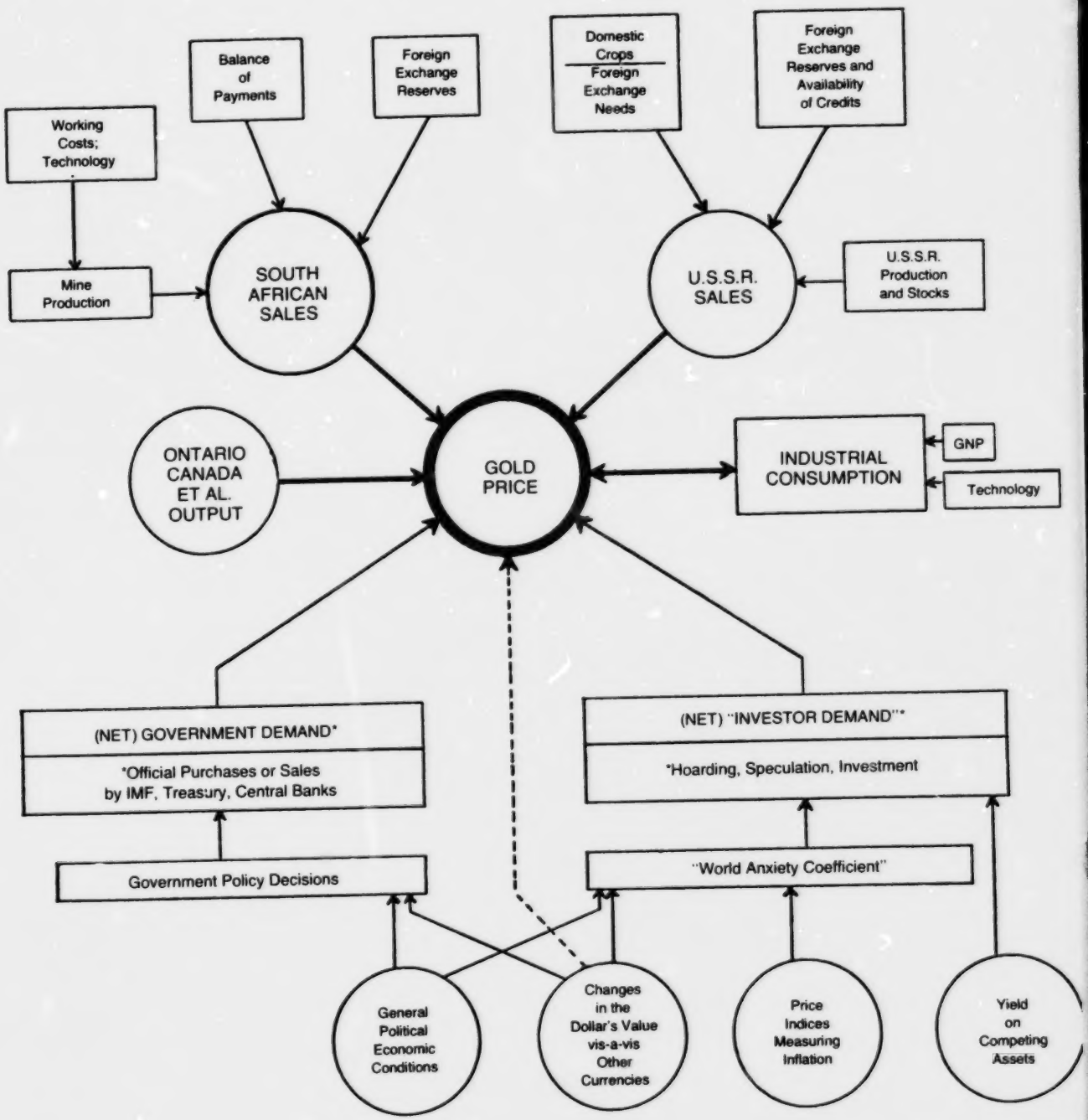
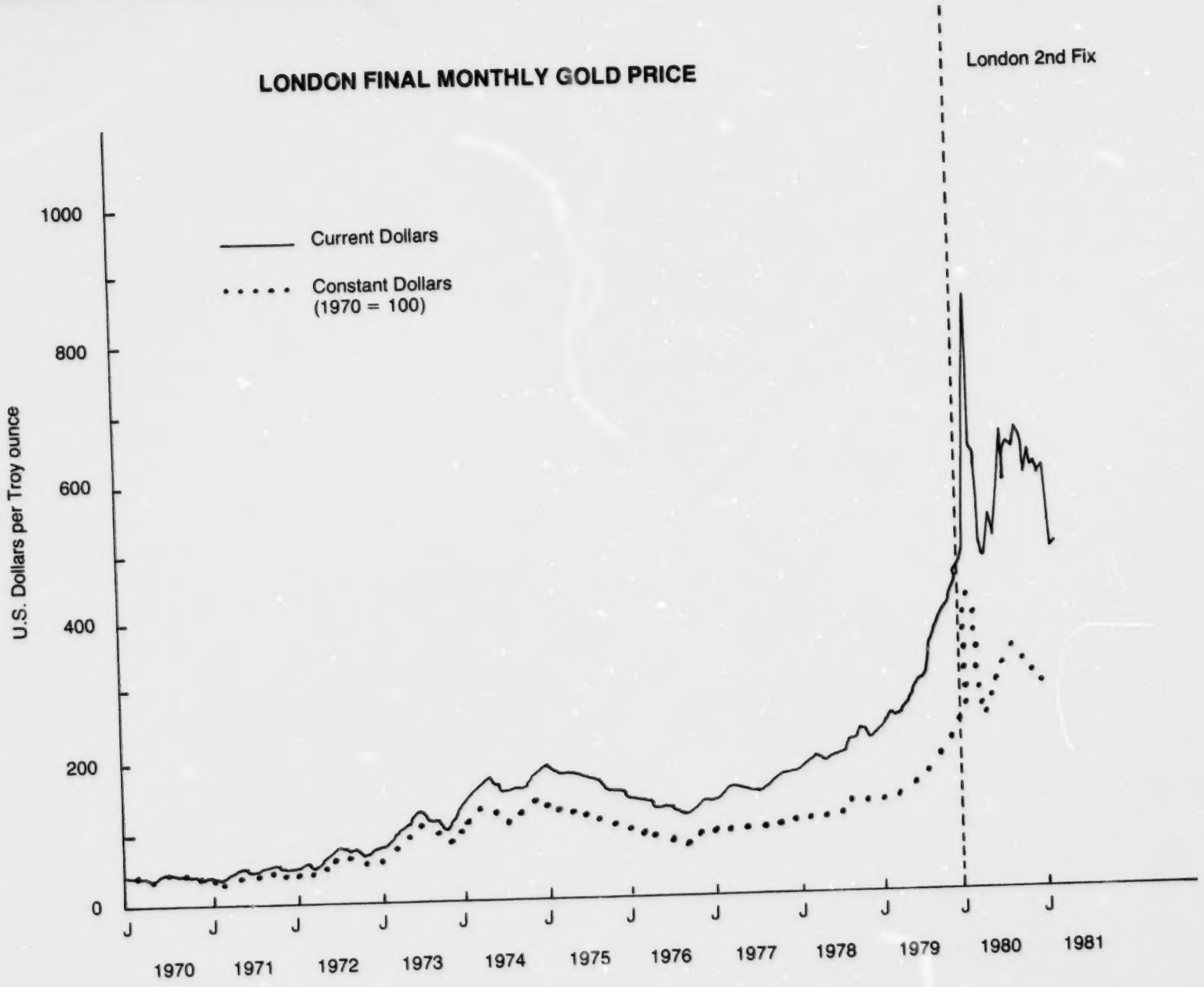


Chart: J. Aron, Precious Metals Research Department

LONDON FINAL MONTHLY GOLD PRICE



THE IMPLIED VALUE OF GOLD, 1950-1985

(CONSIDERING GOLD AS A MONETARY ASSET)

Year	Foreign exchange: total holdings in the world's central banks (in billion U.S. dollars)	Gold bullion: total holdings in the world's central banks (in metric tons)	Implied gold value per ounce (dividing col. 3 into col. 2) (U.S. dollars)
1950	$ 17	29,517	$ 18.22
1960	$ 24	33,529	$ 22.36
1965	$ 31	36,919	$ 26.28
1970	$ 59	32,876	$ 55.82
1975	$178	31,570	$175.00
1979	$320	28,926	$344.00
		(Projected)	
1980	$364	29,112	$389.00
1981	$437	29,112	$467.00
1982	$524	29,112	$580.00
1983	$628	29,112	$671.00
1984	$755	29,112	$806.00
1985	$906	29,112	$967.00

Sources: R. C. Young; Silver and Gold Report, early February, 1981

Price—World Situation

Gold is instantly saleable—at all times.

Gold mining companies do not require large, complex marketing departments, field salesmen and market researchers—unlike the major base metal mine producers who have to reduce production or stockpile whenever the market decides to take less of a particular base metal.

In 1978 and 1979, hot money gravitated towards gold—partly because of the problems of the dollar and the Swiss franc, but a substantial movement back into dollars is possible, once people are satisfied that the dollar is realistically valued. Also, when the Soviets re-enter the market, presumably the price will weaken noticeably, possibly dramatically.

Perhaps no metal is surrounded with such strong opposing forces and attitudes as gold. This tends to make it an exciting instrument for sharp speculation abroad in free market gold.

The gold situation is inherently supra-national. Once primary gold metal is produced it has no real nationality. It becomes a completely international item of trade which flows freely, except where governments impose restrictions on its citizens.

RUSSIAN VIEW OF THE PRICE OF GOLD

"On the capitalistic market, gold performs the function of a world currency for the socialistic nations in trading with the market economy nations."—Tregolov, Course in Political Economics, page 287.

The Soviet Ministry of Foreign Trade stated in 1972 that Russia's view was that world trade could not be based on just one currency or even several currencies, but that a more solid foundation was required and that foundation could only be gold. Gold is the key medium of exchange for Russia and China in their dealings with the West, but in the past Russia has preferred to market as much platinum, palladium, nickel, oil, etc. as possible and either retain the gold or hold dollars.

The U.S.S.R. appeared to have decided by 1972 to pursue the concept that the value of palladium should be kept fairly close to that of gold. (The Soviet Union produces 70 per cent of the world's palladium.) This has not proved possible since July, 1974. The definition of fairly close included a discount of up to $5.00 per ounce. The logic behind this theory is that *many industrial uses of gold are unquestionably considered interchangeable with palladium*, especially in electronics, and the U.S.S.R. was interested in increasing its lagging palladium sales and in reducing its very large palladium stockpile of about 50 metric tons.

Currently, the palladium/gold price relationship is dominated by the fact that industrial demand for palladium, including dental, held its own and demand from the electronics industry has risen. Consumer stocks are not excessive and may be too low in some cases. The gold price

weakness, which has been caused by many non-industrial factors, has nevertheless exerted a considerable downward influence on the palladium price. The U.S.S.R. is expected to offer less palladium in 1981 for sale on term contracts in the West than in 1980, which would be a bullish factor for the palladium price, but no-one can be sure what will happen.

In view of this, it could be said that the palladium/gold price ratio has not been able to settle down to a firm new pattern.

THE "GOLD PRICE" OF OIL

(BASED ON ANNUAL AVERAGE PRICES)

Year	Barrels of Oil/ Ounce of Gold
1950	12 to 13
1970	14.11
1972	16.94
1974	13.67
1978	14.15
1979 (prices for week ending December 14)	18.65
1980	15.0 to 18.75

Source: Metals Week

The gold price is increasingly related to the price of a barrel of oil. At present prices of gold and oil, they move fairly well in parallel, reflecting the increased "cheapness" of the dollar in gold or oil terms. It should not last and may disappear in the mid-1980's, with declining gold supplies and increasing oil availability. The oil price was still a bargain in the U.S.A. and Canada in mid-1979, expressed in terms of gold. The price of gold had risen from U.S.$35/ounce to $280, (an increase of over 700 per cent). Around 1946, the U.S. thought that its Gulf of Mexico oil was worth $2.68 a barrel. In July, 1979, the U.S. had to pay an average of about $20 a barrel, (or a 646 per cent increase).

OPEC's 1973 and subsequent oil price hikes and the revolution in Iran, the Iraq/Iran War, Afghanistan, the China/Vietnam border problems, Poland etc., helped to push the gold market beyond $200 in 1978 and to $700 in 1980.

The current gold/oil price ratio—based on Saudi crude—demonstrates that one troy ounce of gold buys 22 barrels of oil. Since most Saudi oil is now sold for about U.S.$32 per barrel, the inferred "correct price" for gold is over U.S.$700 a troy ounce, if that is not pushing the relationship too far.

Professor Roy Jastram of the University of California at Berkeley has recently shown gold to be effective as a store of value over the very long term. He found that it took no more gold by weight to buy a clay brick or a loaf of bread in 1960 than it did in 1560.

Negative news on energy and resulting inflation fears have caused buying which has raised the price of many precious metals prices—gold, platinum, silver, rhodium and palladium.

Hard gold would be much more dependable to take to war than fluctuating paper, (in the opinion of some nations.)

Indonesia bought 56 tons of gold between February and December 1980, the first real evidence of an OPEC member investing a high proportion of oil revenues in gold. It can be said that 1978 was the first year in which, on the one hand, Middle East oil-producing countries sought to switch their eroding dollar assets into more profitable assets—investment in gold—and speculators tried to do the same, thereby pushing up the price of gold, and, on the other, the U.S. Government took a series of measures to restore confidence in the dollar, thus depressing the price of gold a little.

So long as the rate of inflation worldwide and the cost of a barrel of oil have only one place to go, the free price of gold will keep rising, as a general trend. Daily or monthly ups and downs in the price should be ignored.

1979 and 1980 appear to be the opening years of a new Restoration for Gold. Much higher world gold prices are enabling mines to expand, old ones to re-open and new ones to be financed—not least in Ontario. More and more people in the world want to own gold.

Gold mines do not have to worry about obtaining a "market share" for their output, as base metal mines do. Gold is always instantly saleable—at some price.

World security definitely deteriorated in 1979 and 1980 and world-wide inflation worsened.

The effects of:

1) The mild U.S. recession of 1969/70;

2) The severe U.S. recession of 1974/76;

3) The established 1979/80 recession period

are reflected in higher gold prices.

In the U.S. in the 1970's, the public began to learn the new lesson of how to live with continuing inflation, (a process which is well known in France, Latin America etc.), i.e. do not put faith in paper currency, bonds etc., but convert your money into tangibles, like gold, silver, platinum, real estate and so on. Gold purchases in the U.S. greatly increased once gold ownership by U.S. residents was permitted from early 1975.

The price of gold in 1979 and 1980 was influenced by the following major factors:

Softness in the gold market late in 1980 was caused by:

1) Higher interest rates which almost always trigger a move away from the holding of gold metal and into dollars.

The new rise in interest rates tends to strengthen the value of the U.S. dollar.

The election of a Socialist President of France, Francois Mitterrand, in May, 1981, pushed the gold price up overnight, but it soon fell back.

Nevertheless, currently, the major bearish factor in the gold price is the elevated level of interest rates.

Interest rates in the U.S.A. could reach 25 to 28 per cent by the end of 1981, according to some observers.

2) Rumours that gold was being sold by West Germany's Central Bank to cover their currency requirements as a result of that country's recent trade deficit.

3) In 1980/81, Canada sold about 60 tons of its Central Bank stock of gold on the free market.

4) Serious fall in sales of jewellery—by about 40 per cent. Use of gold in jewellery is now about half of the level of a few short years ago.

5) The Reagan victory helped to reduce precious metal prices and raise stock market levels.

6) The release of the 50 U.S. hostages in Iran held for 444 days to January 20, 1981, delivered a blow to the gold price—for psychological rather than fundamental reasons. The market had discounted the price to some extent in advance of the event.

7) Weakened industrial demand for gold.

8) The results of the effort to control U.S. inflation.

Strength in 1980 was encouraged by:

a) In November, 1980, the Alaska state Treasurer bought 1.4 metric tons of gold for the $750 million state pension fund—a commodity never seen before in a public retirement fund. He said that gold has a successful anti-inflationary history.

b) Growth in the popularity of gold bullion coins. U.S. citizens bought U.S.$1.3 billion worth of South African Krugerrand gold coins in 1979.

c) Low sales of only 80 tons, (estimated), of gold by the Soviet Union during the year to pay for extra grain purchases from the West and to finance their military effort in Afghanistan.

d) Strong investment and speculative demand for gold. Acceptance of the respectability of gold as a prudent addition to a portfolio—particularly within the United States—to an increasing degree.

e) Diversification out of the U.S. dollar into other forms of investment;

f) The growth in gold futures and options markets;

g) Changes in U.S. Treasury and International Monetary Fund gold sales policies; (reduction in their auctions);

h) The new freedom of the Central Banks to buy and sell gold on the market;

i) Developments in hostilities in the Middle East, particularly in Iran and Iraq, and in the Far East;

j) The development of the current relatively stable international monetary situation;

k) Establishment of the European Monetary System with the European Currency Unit backed, inter alia, by gold reserves.

Future Items

South Africa's International Gold Corporation (Intergold) is conducting a major campaign to convince U.S. and other pension funds that part of their holdings should prudently be in gold metal or specie.

The price of gold may skyrocket if the U.S.A. and/or the U.S.S.R. became directly embroiled in the Near East or if the Strait of Hormuz is closed; THE STRATEGIC 60-MILE STRAIT LEADING TO THE GULF OF OMAN, THROUGH WHICH 40 TO 60 PERCENT OF THE NON-COMMUNIST WORLD'S MINERAL OIL TRAFFIC PASSES INTO THE INDIAN OCEAN AND WORLD ROUTES.

THIS VITAL BOTTLENECK, ONLY 20 MILES WIDE, COULD BE CLOSED QUITE EASILY BY THE SINKING OF A SINGLE TANKER IN THE NARROW MAIN NAVIGATION CHANNEL OR BY THE SOWING OF A MINEFIELD BY A FEW SCUBA DIVERS.

Speculative Funds

An important factor is international speculative funds which influence or amplify changes in the price of gold. Gold speculation or investment in the U.S. market has been on the upswing and speculative capital looking for profitable investment opportunities there is now said to have reached a huge amount.

SWITZERLAND DECIDED AT THE BEGINNING OF 1980 TO TAX SALES OF GOLD MADE IN THAT COUNTRY. A GREAT DEAL OF THE GOLD BUSINESS IN ZURICH HAS THEREFORE MIGRATED TO LONDON—SO MUCH SO THAT THERE WAS A SHORTAGE OF VAULT SPACE IN THE CAPITAL.

Investors will push up the gold price because

1) No more IMF auctions of gold have been planned;

2) There is little sign of the Central Banks moving into the new slimmed-down 5-currency Special Drawing Rights out of gold;

3) Of changeable weather on the political and inflation barometer.

Demand for gold could be influenced by two other factors:

1) Rising U.S. interest rates and a

2) Rising U.S. budget deficit.

Increased defence expenditures expected under President Reagan might however increase the U.S. government's debts. If unmatched by budget cuts elsewhere, this defence spending would indirectly push gold and silver prices upwards, because investors would look towards these two commodities as a hedge against inflation. The prices of strategic metals such as platinum, rhodium, iridium and cobalt would also rise.

Historically, one must remember, gold has maintained its purchasing power.

THE FUTURE OF THE PRICE OF GOLD

THE GOLD PRICE DEFIES PRECISE PREDICTION. THERE ARE SO MANY VARIABLES IN THE MIX OF CONTRIBUTING FACTORS EACH DAY AND OFTEN EACH HOUR OF A DAY. Many experienced observers expect that the current weak phase in the gold price will continue until inflation again accelerates in 1982. The 1980 average was U.S.$612 per ounce. Others go so far as to say that the price will fall in 1981 to the U.S.$375 to $425 level. At a New York Gold Forum in January, 1981, students of gold responded to a poll with an average price expectation of U.S.$700 for January 23, 1982. However, one veteran expert there predicted $434.70 for that date.

There could be wide fluctuations in the gold price during the first half of 1981 which will be a period of patient waiting for a recovery from the recession in Western Europe, the U.S.A. and Canada. M. A. Taschereau, President of Dome Mines, said recently that he expects gold to continue to exhibit its historical tendencies towards extreme fluctuations, but he also expects gold to stay at levels that will encourage mine output. Panmure, Gordon and Co. suggested in late January, 1981 that gold will fall to U.S.$375 an ounce by end 1981—including a rally to about $625 at mid-year.

Swiss observers say that the gold metal price could fall to U.S.$400 in the longer term.

London metal brokers Rudolf Wolff suggests a possible drop to less than U.S.$300 an ounce, adding that gold could revert to its crisis hedge role if there is a serious worsening of economic or political situations, but bullion brokers Sharps Pixley point out that the new Reagan administration's strong stand on foreign affairs could act as a floor on the gold price. One analyst talks of a further major crunch in gold down to $400 an ounce if President Reagan's economic package is strong.

President Reagan mentioned to the Chairman of the Federal Reserve at lunch on 23 January, 1981 that he had seen a prediction that the price of gold might drop to as low as U.S.$250 an ounce. The price of gold then plunged on the Comex in New York. Gold mining stocks also fell.

Some students of gold are convinced that it will reach $1,000 an ounce in 1981. Some predict gold at U.S.$2,000 to $3,000 an ounce and in 1982, with silver at $100 an ounce, (a ration of 1:20 or 30). At any rate, the average price of gold should, at a minimum, maintain its constant or real value, i.e. it should rise by the rate of inflation at least.

The Economist Intelligence Unit believes that precious metal prices are likely to be less volatile over the next two years.

South Africa's mine production of gold is likely to drop considerably after 1987—unless there is a presently unforeseeably high price of gold then—and the country's internal situation during the next six years will presumably worsen.

WITH THESE EVENTS AND EVEN IGNORING RUSSIA'S PROBLEMS WITH GOLD OUTPUT LEVELS, THE FUTURE OF THE GOLD PRICE, (EVEN IN PREDICTED REAL OR CONSTANT DOLLAR TERMS), LOOKS EXTREMELY ROSY, NOT TO SAY WILDLY EXCITING. FROM 1988 ONWARDS AT LEAST, (PROBABLY BEFORE), THE GOLD PRICE WILL REALLY ESCALATE, MAKING THE PRICE GYRATIONS OF 1980 LOOK MINISCULE.

This will, among other things, intensify the hunt for gold, the opening of new mines and expansions of existing gold mines. As the price of gold moves to higher and higher levels, new mining and new exploration ventures to find new deposits will emerge.

GOLD PRICE

Annual Averages	NEW YORK 1000/1000 fine (dollars per troy ounce)
1939	35
1940-1944	35
1945	35
1946	35
1947	35
1948	35
1949	35
1950	35
1951	35
1952	35
1953	35
1954	35
1955	35
1956	35
1957	35
1958	35
1959	35
1960	35
1961	35
1962	35
1963	35
1964	35
1965	35
1966	35
1967	35
1968 (Free market from March 19th)	39.695
1969	41.343
1970	36.190
1971	41.102
1972	58.444
1973	97.583
1974	159.615
1975	161.165
1976	124.939
1977	147.978
1978	193.436
1979	307.615
1980	613.00

GOLD PRICES

U.S. DOLLARS PER TROY OUNCE

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
January	—	42.297	34.942	37.874	45.751	65.139	129.191	176.268	131.488	132.264	173.179	227.055
February	—	42.609	34.994	38.744	48.263	74.198	150.233	179.590	131.070	136.299	178.155	246.311
March	—	43.165	35.086	38.871	48.327	84.372	168.421	178.158	132.578	148.228	183.662	241.246
April	37.870	43.305	35.619	39.014	49.030	90.496	172.235	169.843	127.940	149.166	175.275	239.415
May	40.695	43.463	35.950	40.516	54.618	101.959	163.268	167.390	126.935	146.605	176.307	257.614
June	41.126	41.438	35.435	40.102	62.092	120.119	154.100	164.238	125.709	140.778	183.752	279.300
July	39.499	41.757	35.321	40.952	65.665	120.166	142.978	165.165	117.755	143.393	188.726	295.633
August	39.181	41.108	35.380	42.728	67.034	106.761	154.638	162.998	109.929	144.950	206.300	320.261
September	40.194	40.869	36.193	42.022	65.465	102.970	151.767	144.093	114.145	149.524	212.076	358.253
October	39.209	40.459	37.518	42.504	64.864	100.077	158.776	142.757	116.143	158.860	227.393	389.004
November	39.787	37.428	37.440	42.858	62.912	94.916	181.655	142.415	130.464	162.100	206.073	391.329
December	41.099	35.180	37.435	43.484	63.909	106.719	183.850	139.303	133.878	160.450	207.834	466.389
Yearly Average	39.264	41.106	35.942	40.805	58.161	97.324	159.259	161.018	124.836	147.718	193.228	307.817
						High	195.250	185.250	140.250	167.950	227.393	
						Low	116.500	128.750	103.500	129.750	173.179	

FOREIGN EXCHANGE RATES—CANADA

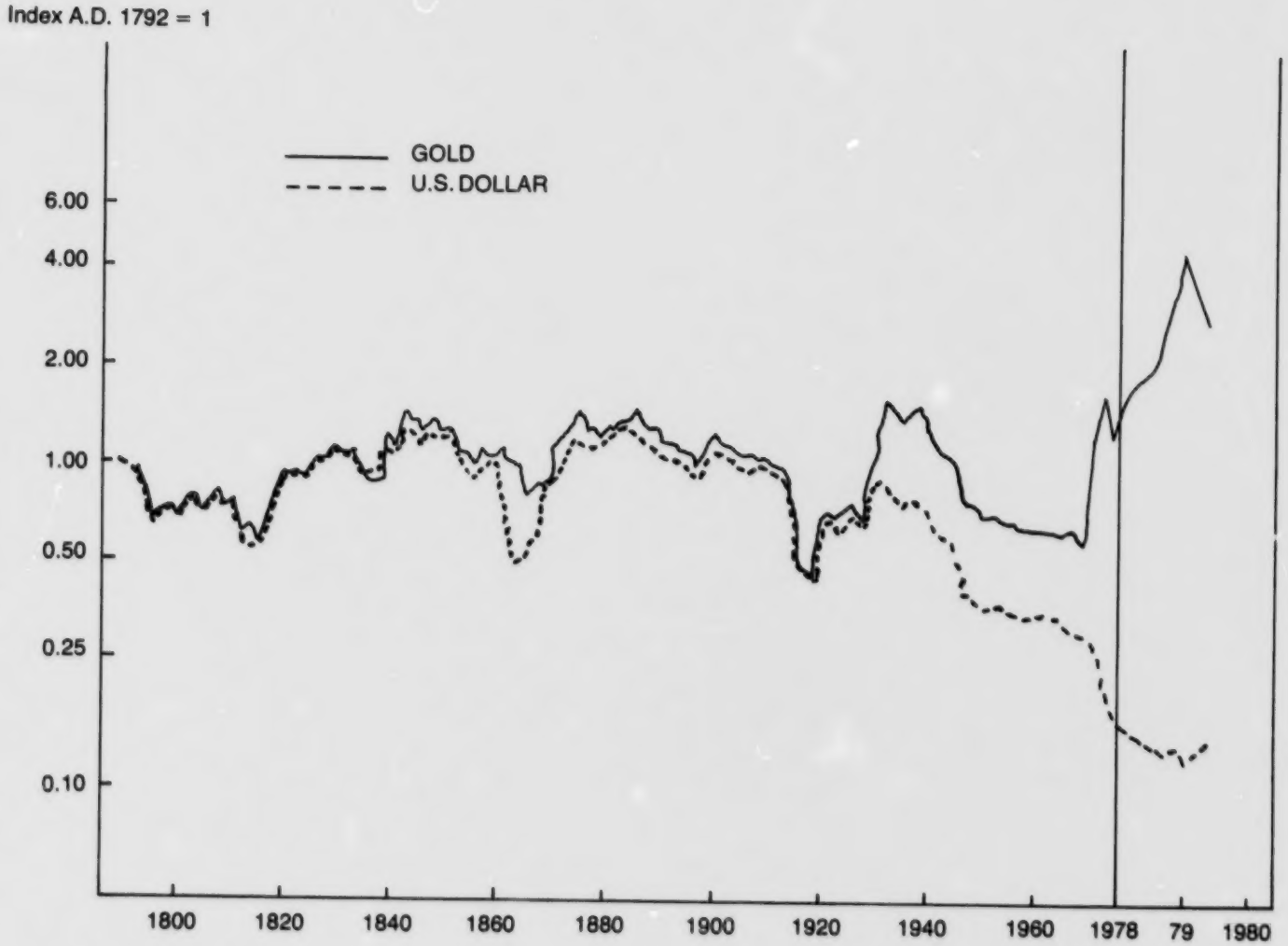
U.S. DOLLARS PER CANADIAN DOLLAR

	1974	1975	1976	1977	1978
January	1.00859	1.00526	.99359	.98985	.90810
February	1.02398	.99957	1.00652	.97295	.89850
March	1.02877	.99954	1.01431	.95125	.88823
April	1.03356	.98913	1.01668	.95103	.87592
May	1.03916	.97222	1.02020	.95364	.89397
June	1.03481	.97426	1.02710	.95549	.89143
July	1.02424	.97004	1.02860	.94230	.88921
August	1.02053	.96581	1.01490	.93028	.87690
September	1.01384	.97437	1.02560	.93168	.85739
October	1.01727	.97557	1.02810	.91010	.84546
November	1.01280	.98631	1.01460	.90145	.85244
December	1.01192	.98627	.98204	.91132	.84763
Yearly Average	1.02257	.98297	1.01410	.94112	.87729

Source: U.S. Federal Reserve Board, average of daily (noon) buying rates for cable transfers in New York.

Some U.S. researchers forecast an 88 U.S. cent Canadian dollar by 1982.

Purchasing Power of Gold and the U.S. Dollar
(Measured by the US Wholesale Price Index)



Source: Credit Suisse

3.2 GOLD/SILVER PRICE RATIO (or Bi-Metallic Ratio)

This existed in ancient times. Around 2700 B.C. it was 1:9. Under Hammurabi in 1800 B.C. it was 1:6. By the 6th Century B.C. it was 1:12 and remained between that and 1:16 for centuries.

Silver's position relative gold has improved over the years. The U.S. government official purchasing price for silver was set in 1934 at 50 cents/ounce, (vis-a-vis gold at $35) making the gold/silver price ratio 1:70. The fixed price for silver was abandoned in 1967 and for gold in 1968. In 1973, the ratio fluctuated between 1:45 and 1:30. On January 22, 1974, "nearby" silver traded on N.Y. Comex at a high of over $4.00 per ounce, for the first time. On February 21st, 1974, Handy & Harman's spot price for silver reached U.S.$6.67 an ounce and the gold/silver ratio went to about 1:26, meaning that the silver price was over twice as strong as it was in 1934, relative to gold. However, the ratio went back to 1:34 in 1978. A 1:30 gold/silver price ratio would be more normal than the 1:40 of mid/1980. See Chapter on Ancient Gold Sources—Gold/Silver Ratio.

During the 1970's, gold sold for 28.5 times the price of silver. In November, 1980, the ratio was 1:34.

Market specialists figure that some 90 per cent of the fluctuations in the silver price can be explained by changes in the price of gold since 1968.

The correlation between gold and silver prices could become even closer, according to Credit Suisse.

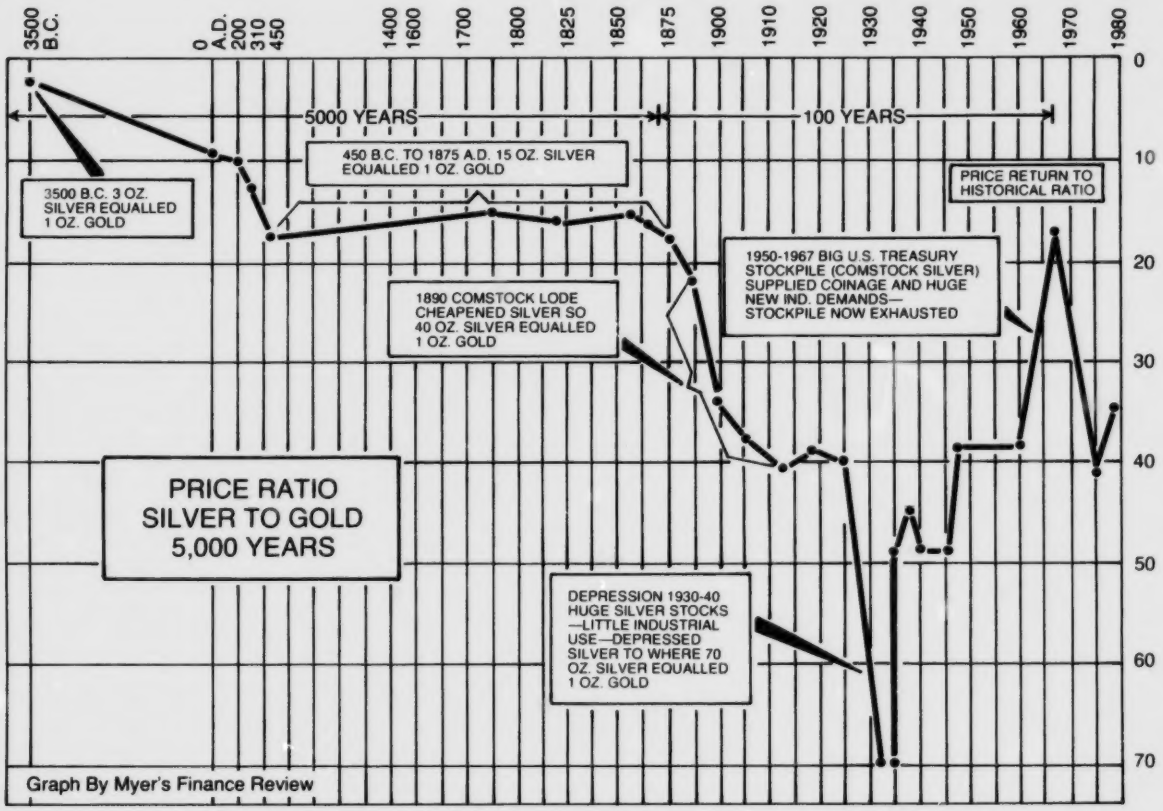
The eminent trader Paul Sarnoff says that when the ratio gets above 34 to 1, gold is too expensive in relation to silver—time to buy silver or spread by selling gold and buying silver. If the ratio drops below 27 to 1, then silver is too expensive in comparison to gold.

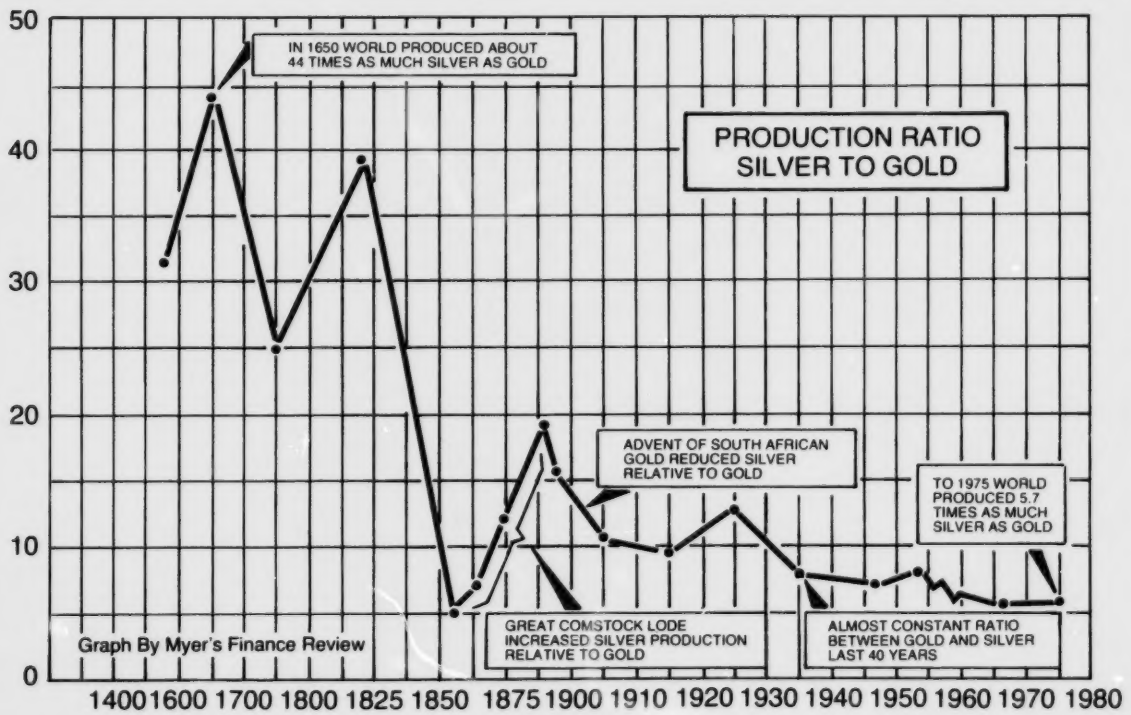
Professor W. C. Lacy of James Cook University in Australia has calculated the relationship between the selling prices of gold, together with silver, in constant terms and the number of days, (or hours), worked at the wages prevailing.

In 1966, the year before the silver price was freed and two years before the gold price was unfrozen, the constant dollar selling price for gold sank to the equivalent of 1 day's wages for one ounce, the all-time low. In 1980 it was equivalent to about 10 days' wages—the same as it had been in the early 1930's and around 1905.

Incidentally, silver's constant price all-time "low" was reached in the period from the early 1940's through the early 1960's, (when it was not free), at the equivalent of less than 1 hour's wages. It has not been 2 hours since 1913, but it almost got there in 1980.

His prediction for the future is that a reasonable long term price for gold that takes into account bulk low-grade deposits, the major source of future supply, with cut-off grades of 1 gram per metric ton and an assumed buyer resistance level, would be about 5 days' wages per ounce of gold, which he says would be around U.S.$350 per ounce under the inflation conditions of early 1981.


3500 B.C.
0 A.D.
200
310
450
1400
1600
1700
1800
1825
1850
1875
1900
1910
1920
1930
1940
1950
1960
1970
1980
0
10
20
30
40
50
60
70
5000 YEARS
100 YEARS
3500 B.C. 3 OZ. SILVER EQUALLED 1 OZ. GOLD
450 B.C. TO 1875 A.D. 15 OZ. SILVER EQUALLED 1 OZ. GOLD
1890 COMSTOCK LODE CHEAPENED SILVER SO 40 OZ. SILVER EQUALLED 1 OZ. GOLD
1950-1967 BIG U.S. TREASURY STOCKPILE (COMSTOCK SILVER) SUPPLIED COINAGE AND HUGE NEW IND. DEMANDS— STOCKPILE NOW EXHAUSTED
PRICE RETURN TO HISTORICAL RATIO
PRICE RATIO SILVER TO GOLD 5,000 YEARS
DEPRESSION 1930-40 HUGE SILVER STOCKS —LITTLE INDUSTRIAL USE—DEPRESSED SILVER TO WHERE 70 OZ. SILVER EQUALLED 1 OZ. GOLD
Graph By Myer's Finance Review


50
40
30
20
10
0
IN 1650 WORLD PRODUCED ABOUT 44 TIMES AS MUCH SILVER AS GOLD
PRODUCTION RATIO SILVER TO GOLD
ADVENT OF SOUTH AFRICAN GOLD REDUCED SILVER RELATIVE TO GOLD
TO 1975 WORLD PRODUCED 5.7 TIMES AS MUCH SILVER AS GOLD
GREAT COMSTOCK LODE INCREASED SILVER PRODUCTION RELATIVE TO GOLD
ALMOST CONSTANT RATIO BETWEEN GOLD AND SILVER LAST 40 YEARS
Graph By Myer's Finance Review
1400 1600 1700 1800 1825 1850 1875 1900 1910 1920 1930 1940 1950 1960 1970 1980

VALUE RATIO OF GOLD TO SILVER THROUGH THE AGES[1]

Year	Value Ratio	Remarks, Authority, etc.[2]
Prior to 3500 B.C.	1 or less	No records
c. 3500	2.5	In Egypt. Code of Menes
708	13.5	In Assyria. Cuneiform inscriptions at Nineveh
500	13.0	In Persia. Herod III
400	12.0	In Greece. Plato
404-336	12.0	In Greece, Peloponnesian war to time of Alexander
300	10.0	In Greece. Fall in gold value due to influx of Alexander's spoil.
207	13.7	In Rome
186	10.0	In Rome
58-49	8.9	In Rome. Fall in gold value due influx of Caesar's spoil.
1-37 A.D.	10.9	In Rome. Reigns of Augustus and Tiberius
54-68	11.8	In Rome. Reign of Nero
81-96	11.3	In Rome. Reign of Domitian
312	14.4	In Byzantium. Reign of Constantine
438	14.4	In Rome and Byzantium. Theodosian code
864	12.0	In Europe. Edictum Pistense
1344-1482	11.1	In England. Mint returns
1482-1492	12.2	In Europe
1492	11.0	In Europe. Discovery of America
1497	10.7	In Spain
1550	12.0	In Europe
1641	14.0	In Europe. Moran and John Locke on money
1690	16.0	In Europe. Sir Isaac Newton
1730	16.0	In Europe. Kelly's "Cambist"
1760	14.3	In London. Del Mar
1800	15.7	In Europe and U.S.A. EMJ
1850	15.7	In Europe and U.S.A. EMJ
1886	22.0	In Europe and U.S.A. Discovery of the Rand
1890	22.1	In Europe and U.S.A. EMJ
1900	34.4	In Europe and U.S.A. EMJ
1910	38.2	In Europe and U.S.A. EMJ
1915	38.2	In Europe and U.S.A. Ist Great War. EMJ
1920	20.8	In Europe and U.S.A. EMJ
1930	60.8	In Europe and U.S.A. EMJ
1935	45.5	In Europe and U.S.A. EMJ
1940	50.0	In Europe and U.S.A. 2nd Great War. EMJ
1950	41.2	In Europe and U.S.A. EMJ
1960	38.5	In Europe and U.S.A. EMJ
1970	21.1	In Europe and U.S.A. EMJ
1975 (January)	41.9	In Europe and U.S.A. EMJ

[1] The figures given are calculated value ratios in the currency of the time and all should be read as follows: 2.5 indicates that at the stated time *gold* was two and one-half times the value of silver; 12 that it was twelve times, and so on.

[2] Sources of information include various documents in the British Museum and British Library, London; National Museum, Athens, Greece; Vatican Library, Rome; Jacob (1831), and Del Mar (1880). The values since 1800 were obtained mainly from the Engineering and Mining Journal (EMJ) annual volumes. No attempt was made to authenticate all of the values shown, and no adjustments have been made to compensate for differences between the various currencies of different countries. For a thorough discussion of the value ratios prior to 1880 see Del Mar (1880).

Source: The Geochemistry of Gold and Its Deposits, Geological Survey of Canada, 1979

Chapter 4 Free Commodity Markets for Gold (Where the Gold Price is Created)

The gold market is controlled by those who *own* gold.

DURING THE LAST FOUR YEARS OR SO, THE WORLD GOLD MARKET HAS UNDERGONE A FUNDAMENTAL ALTERATION, CHANGING FROM A RATHER LIMITED GROUPING OF SOMEWHAT CONSTRAINED INTERESTS TO A MUCH STRONGER, EXTREMELY BROAD BASIS OF INTERESTS WHICH RANGE FROM THE MAJOR CENTRAL BANKS AND FUND MANAGERS TO INDIVIDUAL MEMBERS OF THE PUBLIC AROUND THE WORLD BUYING QUITE SMALL QUANTITIES OF GOLD IN BAR OR COIN FORM, AN ACTIVITY HOWEVER WHICH HAS BUILT UP INTO A FORMIDABLE TOTAL.

Gold, of course, is not uniformly permitted to be held freely in bullion form by residents of all countries.

One year's world mine production of gold does not take up very much space. If fully refined to pure gold and melted down and cast into one lump, it would form a cube measuring only about 12 feet by 12 feet by 12 feet, (4 yards by 4 yards by 4 yards). It would fit into a small bedroom quite easily, but of course the enormous weight of the gold, 1,040 short tons, would cause the floor to collapse.

There is no "producers' price" for gold, as there is for platinum, palladium, nickel, copper etc.

The only truly international gold markets (based on the standard 400 ounce, 12.5 kg. "good delivery" bar), are those in London, Zurich, Winnipeg, Chicago and New York. Neither London nor Zurich issues any figures on open interest or trading volume, but the net daily average of London and Zurich together was 5.6 tons a few years ago, according to a leading bullion market member, S. Montagu.

By international custom, spot price gold bullion deals are settled for cash within 48 hours. Metal traders tend to buy on expectations and to sell on hard news.

The free market price for gold fluctuates daily. The present world "free market" in gold dates only from March, 1968.

4.1 WINNIPEG COMMODITY EXCHANGE, CANADA

THE WORLD'S FIRST GOLD FUTURES TRADING in "good delivery" gold bars commenced late in 1972, on the 100-year-old Winnipeg Commodity Exchange. Unlike London, trading volume and open interest figures are issued daily. A clearing house of high reputation stands behind each contract. It is used by Americans and Europeans, as well as Canadians.

The Winnipeg gold contract has proved to be professional and international in scope and many large multi-national corporations and investment trusts have switched a portion of their liquid funds into gold. The Winnipeg Gold Futures Market has proved to be a stabilizing element, allowing industrial users a hedging mechanism against price changes. The price discovery and risk shifting functions have proved to be extremely valuable.

There are presently two gold futures contracts trading on the Winnipeg Commodity Exchange. The standard or 400 troy ounce contract and the centum or 100 ounce contract which was initiated later on June 10, 1974. The latter is the underlying futures contract for the gold called option, which was developed in April, 1979. Since even a 100 ounce contract is now quite expensive for a majority of the trading public, futures contracts and options will be split 5 to 1 so the contracts will be for 20 ounces of gold bullion.

ONTARIO BENEFITS DIRECTLY AND CONTINUOUSLY FROM THIS TRADING BECAUSE THE PHYSICAL GOLD BARS HELD AGAINST EACH GOLD FUTURES CONTRACT ARE ACTUALLY STORED IN THE TORONTO, ONTARIO VAULTS OF THE BANK OF NOVA SCOTIA OR OF THE CANADIAN IMPERIAL BANK OF COMMERCE. JOBS IN TORONTO AND DISPOSABLE INCOME IN ONTARIO HAVE RESULTED.

The Winnipeg Commodity Exchange gold futures contracts have been approved under Ontario's Commodity Futures Trading Act of 1978.

Even in Canada there are difficulties with gold as a commodity. The writer was with the Winnipeg Commodity Exchange. Launching the world's first gold bullion futures contract on an Exchange backed by a Clearing House involved getting permission from the Canadian equivalent of the U.S. Federal Reserve, the Bank of Canada. One rapidly comes to understand that even in Canada gold is not an ordinary commodity. The objection was raised that the main document in the gold futures contract agreement, a warehouse receipt for the gold issued by an Ontario bank that was negotiable for a good London delivery standard gold bullion bar, was a piece of paper redeemable in gold bullion and therefore it would follow that that paper was "currency" or "money", a circulating medium by which the purchase of commodities is effected and consequently could not be legally issued by a commercial bank. The Central Bank of Canada finally agreed to a strict procedure for the

endorsement and handling of warehouse receipts for gold on the Exchange that, in its opinion, lawfully avoids such an identification of the paper warehouse receipt as currency or money.

The 400 ounce contract and the later centum represented the world's first exchange-traded gold futures contracts and effectively remained so until January 2, 1975. At that time, the restrictions on ownership of gold bullion by citizens of the United States were removed and gold futures contracts were speedily approved by the Commodity Futures Trading Commission for several major U.S. commodity exchanges. At present, gold futures contracts are offered in the U.S.A. on the Chicago Board of Trade, Commodity Exchange Inc., the International Monetary Market and the Mid-American Commodity Exchange.

The gold futures contracts are instruments which fulfil the economic purpose of a mechanism for hedging against price risk. Indeed the impetus for the creation of these contracts on the Winnipeg Commodity Exchange sprang partly from the recognized need for some form of hedging mechanism for custom refiners, mine producers of gold and commercial users of gold. This need had become particularly acute following the introduction of the two-tier international gold pricing system in 1968, in which the monetary price was fixed, but the free price was allowed to fluctuate in the open market.

The early years of trading in these contracts on the Winnipeg Commodity Exchange were characterized by a heavy involvement on the part of hedgers as well as the anticipated U.S. gold licensees of the U.S. Treasury and Europeans. In fact, the new members attracted to the Winnipeg Commodity Exchange included a large number of industrial users of gold, many of whom were able to take long and short positions in order to minimize market risk in dealing with both producers and downstream consumers.

As of 1979, U.S. commission merchants cannot sell Winnipeg gold call options, (started April, 1979) to the U.S. public, but brokers outside of the U.S.A. can.

The Winnipeg Commodity Exchange introduced silver futures trading early in February, 1981.

Delivery Point in Ontario

Deliveries of gold are on the basis of a gold certificate issued by a Canadian chartered bank, approved by the Exchange, providing for delivery of the gold at the bank's principal office in Toronto, Ontario. The banks approved for delivery on Winnipeg futures are The Bank of Nova Scotia and The Canadian Imperial Bank of Commerce.

Contract Deliverable Grades

Minimum 995 parts per 1,000 fine gold, bars to be serially numbered and stamped by a melter or assayer declared acceptable for good delivery on the London Gold Bullion Market.

4.2 LONDON

The London Gold Market consists of five firms and it is interesting to note that one member was founded in 1684, ten years before the Bank of England obtained its charter and the most recently formed member was founded in 1853.

In London, since 1919, the Gold Bullion Market, (comprising N. M. Rothschild & sons Ltd.; Samuel Montagu; Mocatta & Goldsmid; Sharps, Pixley and Johnson Matthey, dealing with each other as brokers or as principals), issues the bullion brokers' spot gold price at two daily fixings. The commercial grade sold is minimum 99.5% purity.

The so-called London Bullion Market list of "accepted Melters and Assayers" shows those firms whose stamp makes a gold bar "good delivery". See Chapter 10.1.

Since 1971, the London Gold Bullion Market has quoted the gold price in U.S. dollars only.

A considerable amount of gold all over the world changes hands on the basis of the London Second Fix or Fixing, even though most of such deals do not actually go through the London Bullion Market. TRADING VOLUME AND OPEN INTEREST FIGURES ARE NEVER ISSUED, but London Bullion Market volume has probably averaged about two tons of gold per day. (In 1968, the London Gold Market was trading an estimated 18 tons of gold a day.)

THE LONDON AND ZURICH GOLD PRICES ENJOY ONE ADVANTAGE IN NORTH AMERICA. THE FIRST PRICE FIXING IS AVAILABLE IN THE EASTERN U.S.A. AND CANADA AT BREAKFAST TIME AND THE SECOND (CLOSING) FIXING IS AVAILABLE THERE AT 10 A.M. FOR MOST OF THE YEAR.

Applications to become associate members of the London Gold Bullion Market are reported to have been submitted by Derby & Co., U.K., (Philipp Bros.), Engelhard Industries and three or more other firms. Bullion dealers, are exempt from payment of U.K. VAT (value added tax) on every gold transaction.

Trading on the new London Gold Futures Market will begin on September 7, 1981.

"The Gnomes of Zurich"

In Zurich, the gold pool market comprises the "Big Three" Swiss banks, Union Bank, Swiss Bank Corporation and Credit Suisse, who deal with one another as principals, not merely as brokers. The size of the Swiss Gold Pool is secret, contributing to the nickname "Gnomes of Zurich", but it is believed to average about 300 metric tons. The spot gold prices are fixed by mutual consent and the closing price is published worldwide. TRADING VOLUME AND OPEN INTEREST FIGURES ARE NEVER ISSUED. In 1977, the Swiss Bank Corporation alone sold about 900 metric tons (28.9 million troy ounces) of gold.

By the second half of the 1960's, the Swiss banks were already taking up a good three-quarters of the metal reaching

the market via London. The total demand from Switzerland as the pivot of the international gold trade had already then become the decisive factor in the London market. At first, however, this was hardly apparent to outsiders.

Before March 18, 1968, London had a monopoly as a gold trading centre.

Up to then, Zurich had been largely a *secondary* market trading private customers' gold, but now for the first time it played a direct and important role in the distribution of current production.

From March, 1968, the climax of the gold crisis, the central banks disappeared from the market. London remained closed for a time and then South Africa discontinued its gold sales—one of the chief reasons for this move being the country's then favourable balance of payments—and for a limited time Zurich was faced with the task of having to regulate the demand and supply of gold for the entire world market.

When in the summer of 1969 South Africa resumed its gold sales, it chose Zurich as its main outlet, the demand and supply of gold being largely dominated by the clients of the Swiss banks—the private gold owners. This major switch away from London was caused by the anti-South African policies of the U.K. labour government between 1966 and Since 1973, South Africa has offered virtually all of its mine production of gold for sale—either as bullion bars or as Krugerrand 1-ounce gold coins. About 80 per cent of the South African gold production was channelled through the Zurich market.

Since, under worldwide inflation, world mine output of gold is now insufficient to meet world demand at stable prices, the gold price has been rising, with actual price increases somewhat less than potential ones because of Soviet supplies and sales from official reserves.

The Soviet Union entered the free gold market in 1971, making almost exclusive use of Zurich channels.

Auctions of Gold

Swiss Banks have to date taken a good third of the gold auctioned by the International Monetary Fund (IMF) and by the U.S. Treasury—making the Swiss the second largest buying group.

Physical Gold Supply

Approximately two-thirds of the annual supply of physical gold passed through the hands of the big banks on the Zurich gold market.

Trading volume figures are never issued, but Zurich probably averaged 12 tons or more of physical South African gold weekly.

In 1972, (before the oil crisis), the Zurich market "traded" about 4,000 tons of gold bars. A sale of only half a ton was able to push the price down by one dollar an ounce in 1973.

About a quarter of the gold sold in Zurich goes to the Middle East in various forms.

SWITZERLAND DECIDED AT THE BEGINNING OF 1980 TO TAX SALES OF GOLD MADE IN THAT COUNTRY.

4.3 U.S.A.

Futures trading in the U.S.A. in gold sovereigns (British gold coins) was launched in Los Angeles on July 20, 1971 but was promptly halted by the U.S. Treasury.

In Canada, gold was and is traded completely freely either on a cash basis at banks, or on a futures basis at Winnipeg from 1972.

U.S. Liberalisation of Private Gold Purchases in the U.S.A. and Releases from U.S. Government Gold Stocks

The U.S. Congress in 1973 authorized the President at his discretion to permit the domestic ownership of gold. In December, 1973, U.S. citizens were given the legal right to own gold coins minted up to end-1959, not 1934 as previously. Then at the end of 1974 came permission to own bullion gold.

American citizens have thus been allowed to own bullion gold since the beginning of 1975.

In the U.S.A., the purchase and sale of fine gold bullion for industry was strictly controlled by U.S. Treasury licensing procedures until December 31, 1974. Gold markets have operated in the U.S.A. under the new law only since then.

Trading in gold on the U.S. commodity markets increased from 23 tons in 1974 to an unbelievable 32,000 tons of gold in 1979. Even veteran traders find this hard to grasp. U.S. Futures exchange stocks at end-1980 were about 141 metric tons.

The U.S. government established a program for the sale of some of its huge gold stock to the public. In the long term, the steady release of sizeable but modest quantities of gold from the huge U.S. government stock must be seen as having surprisingly little effect on the free market price.

Trend

Dominance in gold futures trading has been swinging away from the London-Zurich axis to the Chicago-Winnipeg-New York triangle. Swiss bankers say that the New York Commodity (Futures) Exchange (Comex) has acquired so much power in the gold market that its influence is greater than London's. Gold price fluctuations are now largely dominated by gold futures trading on Comex and on the IMM, (International Monetary Market).

Comex traded 1.2 million gold contracts in December, 1980. The volume in 1980 totalled 8 million gold contracts of 100 troy ounces each in 1980, a total trading of about 25,000 metric tons of gold.

In 1980, the nearest maturing gold futures contract opened the year at U.S.$562 a troy ounce, shooting to U.S.$875 an ounce on January 21 and then falling to as low as $435 before closing on December 31 at $591.

Gold Stocks in Depositories of U.S. Commodity Exchanges

At November 26, 1980, the gold stocks held in IMM-approved warehouses amounted to a record 161 metric tons, but about 156 metric tons of that were a duplication of gold stocks already accounted for by Comex-approved warehouses.

4.4 OTHER EXCHANGES

France and Germany

In Europe there is a gold market in Paris with dealings taking place every day on the Bourse. The import and export of the metal in France is prohibited for residents of that country and therefore the Paris market is purely internal. A small market also exists in Germany in Frankfurt.

Middle East

In the Middle East the major market until a few years ago was in Beirut where it operated in complete freedom. Lebanon provided a convenient centre for the distribution of gold to other Middle East countries such as Turkey, Iran and Kuwait although its importance diminished as other centres sprang up on the Persian Gulf.

Hong Kong and Singapore

Both these gold trading markets are thriving.

Japan/Netherlands

Japan and the Netherlands may establish gold options markets in 1981.

4.5 GOVERNMENT SUPERVISION OF GOLD EXCHANGES

The rules of a futures market in Canada and the U.S.A. are geared to protect the small investor. The trading of gold futures in the U.S.A. is supervised by the Commodity Futures Trading Commission of the U.S. Federal Government. The CFTC offices are in Suite 4747, One World Trade Center, New York, N.Y., U.S.A. 10048.

The U.S. Treasury is also deeply involved in government policy regarding gold.

Speculative futures trading in gold would be dramatically restricted under new rules proposed in the (U.S.) Federal Register of December 2, 1980 by the C.F.T.C., which would require futures exchanges to set position limited on speculative contracts where no such limits now exist. The rule would put the major portion of the responsibility for probity on commodity exchanges rather than the C.F.T.C.

President Reagan has nominated P. Johnson of Chicago to head the CFTC. Looser regulation of trading is expected.

Chapter 5 Sources and Supply

5.1 SOURCES

Gold occurs almost everywhere. It often occurs uncombined in rock or alluvial deposits. It is found in many metallic ores and may be obtained by cyanidation, amalgamation and smelting methods. Gold is widely distributed in the earth's crust including off-shore deposits and in sea water, but the low gold content often makes recovery uneconomic. The sea, for example, contains 5 to 260 parts of gold per 100 million parts of salt water. These tiny amounts add up to about *10,000 million tons of gold* in the oceans.

5.2 SUPPLY

During the last century and a half, there has been no real shortage of gold in the world, (at a price), except where government restrictions apply.

The current situation is that the Western World is rushing to open gold mines in light of the inevitable upcoming decline in South African mine output of gold and the higher gold prices now available.

5.3 WORLD MINE PRODUCTION OF GOLD

About 90 per cent of the world's newly mined gold production takes place in only four countries: South Africa, Russia, Canada and the U.S.A., in that order. The U.S.A. was once the world's largest mine producer of gold.

The world gold supply rate jumped enormously in the half century between 1847 and 1896. The nineteenth century witnessed the romance and excitement of the gold finds in California, South Dakota and Australia and the discovery of gold in Northwest Ontario in 1871 and later *Canada's Klondike gold rush* of 1896. Much of this gold found its way into coinage.

In 1847, gold was discovered in California. By 1849, (''the 49-ers''), the gold rush was at its height.

In 1851, gold was discovered in Australia and in 1861 in New Zealand.

The huge gold deposits of South Africa were discovered in 1886.

The Free World's mine output of gold peaked in 1966 at 1,284 metric tons.

Current Production

WORLD MINE OUTPUT OF GOLD FELL SLIGHTLY IN 1980 SINCE THE HIGH GOLD PRICE LEVEL ENABLED MINES TO EXTRACT LOWER GRADE ORE.

This is one of the most difficult things for non-mining people to understand, i.e. the gold price goes up and gold output goes down. In total, the world's gold mines are now producing less gold each year. The supply of newly mined gold is dependent upon:

1) the selling price (whether in the free market or for monetary purposes),

2) the cost of labour, capital and equipment, (For geological reasons—irregular veins, narrow ''reefs''—gold mining (except alluvial, placer) is typically far more labour-intensive than other types of mining.)

3) the quality (grade) of the ore deposits available.

4) the domestic assistance or defence policies of individual nations,

5) the profitability of extracting other metals from the same ore, and,

6) new developments in mining technology.

1974 saw the most drastic drop in world mine output of gold, following the oil price crisis.

Mine output of gold fell in many major free world producing countries because escalating labour and fuel costs made many gold mines unprofitable, (in spite of the rise in ''real'' terms of the free price of gold). Non-communist world mine production of gold reached its all-time high in 1970, when the free market gold price averaged only U.S.$36.00 per troy ounce.

Billion dollar mining projects have become somewhat ordinary. Announcements of new projects are, understandably, becoming rarer. Mining projects costing less than U.S.$100 million are becoming quite scarce, except for those exploiting gold deposits.

WORLD MINE PRODUCTION OF GOLD

(recoverable content of ore) (1 metric ton = 32,150.7 fine troy ounces)

Country (in order of importance)	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979e	1980e	1981e	1982e
						(metric tons)							
1. South Africa	1000.4	976.3	909.6	855.2	758.6	713.4	713.0	697.0	706.4	703.	677. e	675.	675.
2. Soviet Union, est.	202.	208.	215.	221.	227.	240.	245.	250.	250.	260.	200. e	n.a.	n.a.
3. Canada (including byproduct of base metal output)	74.9	70.3	64.6	60.7	52.8	51.4	52.62	53.92	53.96	51.14	48.3e	54.	63.
Ontario (included in Canada above)	36.1	35.3	31.7	28.7	24.9	23.5	23.0	23.0	21.8	19.17	18.4e	22.	32.
4. U.S.A.	54.2	46.4	45.1	36.2	35.1	32.4	32.2	32.0	30.2	30.15	29.0	30.	32.
5. Brazil	9.0	9.0	7.2	6.3	5.8	5.3	7.4	8.7	9.4	22.0	26.0e	50?	60?
6. Papua-New Guinea	0.7	0.7	12.7	20.3	20.8	17.9	20.8	22.3	23.4	19.7	n.a.	n.a..	
7. Australia	19.5	20.9	23.5	17.2	16.2	16.3	15.4	19.4	20.1	18.5	17.3	20.5	
8. Philippines	18.7	19.7	18.9	17.8	16.7	15.6	15.6	17.4	18.2	17.1	n.a.		
9. Zimbabwe	15.0	15.0	10.8	10.5	18.6	18.6	17.1	20.0	17.0	14.0	13.0		
10. Dominican Republic	—	—	—	—	—	3.0	12.7	10.7	10.8	11.0	11.8		
11. Ghana	21.9	21.7	22.5	25.0	21.4	16.3	16.6	16.9	14.2	11.5	n.a.		
12. Colombia	6.8	5.9	5.8	6.7	8.2	10.8	10.3	9.2	9.0	10.0	n.a.		
13. China	1.6	1.7	1.8	1.8	2.0	1.9	2.5	3.1	4.7	6.2	n.a.		
14. N. Korea	n.a.	n.a.	5.0	5.0	5.0	5.0	5.0	5.0	5.5	5.5	n.a.		
15. Mexico	6.2	4.7	4.5	4.1	3.9	4.7	5.4	6.6	6.2	5.5	n.a.		
16. Japan	7.9	7.9	9.6	10.4	3.9	4.7	4.0	4.6	6.1	7.0	n.a.		
17. Peru	n.a.	n.a.	2.4	3.2	2.7	2.9	3.0	3.4	3.9	4.0	n.a.		
18. Chile	n.a.	n.a.	2.9	3.0	3.7	4.0	4.0	3.6	3.1	3.4	n.a.		
19. Zaire	5.6	5.4	2.5	4.2	4.4	3.6	4.0	3.0	1.0	1.5	n.a.		
20. India	3.2	3.7	3.3	3.2	3.2	3.0	3.3	2.9	2.8	2.6	2.4		
21. Nicaragua	3.6	3.3	2.8	2.6	2.4	1.9	2.0	2.0	2.1	1.9	n.a.		
Latin America—est. Totals	n.a.	n.a.	n.a.	n.a.	31.2	38.7	45.1	47.0	49.0	65.	82.	94.	106.
Western World—est. Totals	1274.	1180.	1174.	1109.	998.	946.	960.	951.	950.	958.	947.	970.	1,000.
Totals—Whole World Output, (including sundry countries), est.	1400.	1400.	1410.	1345.	1240.	1193.	1,213.	1210.	1,210.	1,213.	1,188.		

These figures are partly derived from information published by Annuaire Minemet, Groupe Imetal; the Mines Department of the Republic of South Africa; Consolidated Gold Fields; Union Corporation; Credit Suisse; I.M.F.; A.B.M.S.; U.S. Bureau of the Mint; U.S. Bureau of Mines; the Bank for International Settlements, and on aggregated figures based on confidential sources.

e - estimates by T. P. Mohide

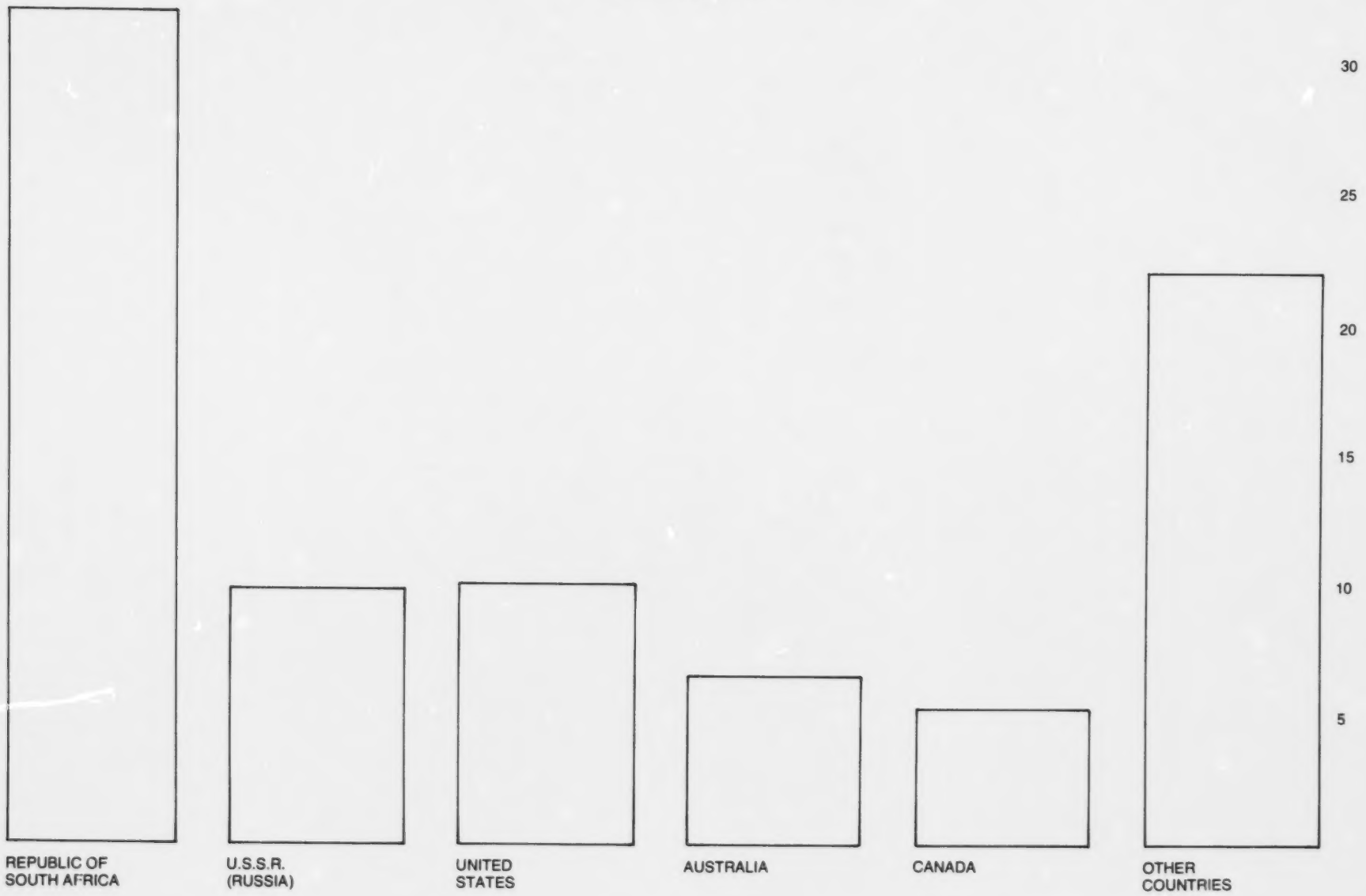
AGGREGATE WORLD GOLD PRODUCTION FROM 1493 TO 1938
(millions of fine ounces)

	From	1493-1600	1601-1700	1701-1800	1801-1900	1901-38
South America	1493	255	554	1,524	1,039 (8.9% of world output)	818 (3.2% of world)
Other Africa	1493	255	199	171	165	1,322
Other Europe	1493	149	100	109	205	243
Mexico	1521	25	37	90	212	874
Russia	1825			6	1,944	1,888
U.S.A.	1849			3	3,586	4,093
Canada	1849				218	1,810
Australia	1851				3,263	2,392
Other Asia	1880				323	1,661
South Africa	1888				638	9,953
World Total		715	896	1,904	11,642	25,181

Note: South America passed its peak of production in the 18th Century.

CUMULATIVE GOLD OUTPUT BY COUNTRY/1493-1973

Thousands Metric Tons



WORLD GOLD PRODUCTION

Year	Kilograms	Year	Kilograms	Year	Kilograms
1800-09*	18910	1902	450813	1941	1213968
1810-19*	12161	1903	495602	1942	1098730
1820-29*	15116	1904	526270	1943	870555
1830-39*	20279	1905	575041	1944	788348
1840-49*	54742	1906	607575	1945	761506
1850-59*	200461	1907	623313	1946	775907
1860-69*	189948	1908	668227	1947	788379
1870	156450	1909	687200	1948	826077
1871	198471	1910	688848	1949	857833
1872	180337	1911	699050	1950	878890
1873	171193	1912	704089	1951	851395
1874	166714	1913	695224	1952	868253
1875	166123	1914	659953	1953	863899
1876	168891	1915	704462	1954	906137
1877	186651	1916	685738	1955	946820
1878	186216	1917	628787	1956	978328
1879	168456	1918	576129	1957	1015341
1880	166372	1919	545648	1958	1047440
1881	157508	1920	507111	1959	1124452
1882	151971	1921	497251	1960	1175991
1883	147617	1922	481201	1961	1222180
1884	155983	1923	553050	1962	1293904
1885	153806	1924	591930	1963	1342021
1886	163479	1925	591370	1964	1394711
1887	171349	1926	601634	1965	1437758
1888	188113	1927	603034	1966	1448799
1889	180835	1928	604433	1967	1422579
1890	199062	1929	609286	1968	1435549
1891	219590	1930	649222	1969	1449795
1892	234644	1931	694882	1970	1481769
1893	269262	1932	754414	1971	1450261
1894	296042	1933	793480	1972	1397945
1895	302232	1934	840664	1973	1341399
1896	354486	1935	916308	1974	1255927
1897	432991	1936	1029556	1975	1203891
1898	468822	1937	1096801	1976	1226472
1899	386336	1938	1169428	1977	1224015
1900	394765	1939	1232786	1978	1235025
1901	394765	1940	1311820	1979	1237514

*Annual average production for the ten year period.

Sources: 1800-1870 American Metal Market "Metal Statistics 1974", attributed to Dr. Adolph Soetbeer

1871-1979 U.S. Bureau of Mines, with 1970-1979 adjusted to reflect estimates for Brazil

5.3.1 WORLD MINE PRODUCTION RESERVES—GOLD

(million ounces)

	Mine Production		Reserves
	1977	1978	(Geological)
Canada	1.7	1.7	45
U.S.A.	1.1	0.97	110
South Africa, Republic of	22.5	22.9	580
Other Free Market Economies	5.7	5.8	200
Centrally Planned Economies	8.0	8.2	260
World Total	39.0	39.6	1,200

Source: Mineral Commodity Summaries, U.S. Department of the Interior, Bureau of Mines.

5.4.1 WORLD GOLD RESOURCES AND PRODUCTION CAPACITIES

Areas	Total resources (metric tons)	Estimated 1980 mine production "capacities" (metric tons)
North and Central America:		
Canada	2,015	80.6
United States	7,440	74.4
Mexico	775	n.a.
Other	775	43.4
Total	11,005	198.4
South America:		
Total	1,085	31.0
Europe:		
U.S.S.R.	9,300	272.8
Other	775	25.7
Total	10,075	298.5
Africa:		
Ghana	930	n.a.
Zimbabwe	775	n.a.
Republic of South Africa	30,380	899.0
Other	930	62.0
Total	48,415	961.0
Asia:		
Japan	310	n.a.
Philippines	775	n.a.
Other	775	n.a.
Total	1,860	46.5
Oceania:		
Australia	1,705	n.a.
Other	620	n.a.
Total	2,325	71.3
WORLD TOTAL	74,765	1,606.7

Source: Mining Equipment International

Opening of New Gold Mines and Reopenings

Increases in the price of gold do not always significantly affect supply because:

1) reopening of old mines to lower grade ores is costly when dealing with deep mines which have been abandoned,

2) the large capital outlays used to bring new mines into production require that gold prices be stable at their high levels,

3) nations which now subsidize gold mining companies may reduce compensation in direct relation to price increases, and

4) companies which own lower grade ore deposits may prefer to mine these rather than deplete their existing high-grade deposits. In South Africa, the government forces mines to do this. However, technological discoveries which allow gold to be mined from ocean floors as in Russia in recent years or removed from salt water solution could result in vast increases in production.

The classical effect of a gold price rise is an immediate lowering of the grade mined, accompanied by a fall in gold output. Both in South Africa and in *Canada*, a much higher gold price means:

1) that some lower-grade gold ore is now being mined which cannot be worked when the price of gold is low—in other words, ore reserves of gold are increased—and

2) that existing mines will have longer lives by significantly extending the life of the ore reserves.

If the free price of gold shows greater stability in the future, the gold mining industry stands to gain from it.

Higher gold prices stimulate exploration for gold around the world, but discoveries in the last decade have not discovered an area of mineralization large enough to replace the Witwatersrand.

Preliminary Estimates
Total World Reserve Ratios
-U.S.B.M data

Metal	(Estimates made in 1979) Number of Years of Reserve	(Estimates made in 1968) Number of Years of Reserve
GOLD	13	26
Silver	17	20
Zinc	24	23
Tin	39	19
Lead	46	32
Tungsten	52	40
Copper	74	52
Nickel	84	141
Molybdenum	86	463
Cobalt	92	109
Platinum Group Metals	117	133
Manganese	250	85
Chromium	358	423

Note: Not independently verified

The reserve figures used for 1968 and 1979 are not exactly comparable. The point is that all reserve ratios exceed mine planning horizons.

1981 CAPITAL INVESTMENT PLANS OF THE MINERAL INDUSTRY: MAJOR COMMODITIES, NUMBER OF PROJECTS, INVESTMENT IN MILLION DOLLARS

Commodity	North and Central America		South America and Caribbean		Europe		Africa	
	No.	US$ Million	No.	US$ Million	No.	US$ Million	No.	US$ Million
Gold:	16	553.4	1	76	1	—	7	3,126

The discount on the Canadian dollar's exchange rate vis-a-vis the U.S. dollar in the four years since the spring of 1977 has greatly benefitted the financial health of Canadian and Ontario mines—not least the gold mines—because gold and most metals are traditionally sold in the market for U.S. dollars and the 15 per cent or so differential makes a mine's revenue in terms of Canadian dollars that much higher. Of course, some of this gain is offset by increased currency exchange costs on imported machinery and materials essential to the mine, but due to the relatively higher labour intensity of underground gold mining, this is of less importance than for base metal mining.

Japan and Asia		Australia and Oceania		Total all areas	
No.	US$ Million	No.	US$ Million	No.	US$ Million
1	—	5	1,105	30	4,660.4

5.4.2 GOLD PRODUCTION OF SOME MINING COMPANIES

	TROY OUNCES			
	1975	1976	1977	1978
CANADA				
Dome Mines Ltd., Ontario, Canada	117,089	119,504	94,261	94,161
Campbell Red Lake, Ontario		5.7 tonnes	5.9 tonnes	5.7 tonnes
Geco Division of Noranda Mines Ltd., Ontario, Canada	3,400	3,300	3,970	2,355
Hollinger, Ontario, Canada (c)	16,891	5,477	—	—
Kerr-Addison, Ontario, Canada	102,770	110,740	106,100	83,200
Pamour Porcupine Mines Limited, Ontario, Canada (m)	125,047	153,428	164,267	161,372
Noranda Mines Ltd., Canada (g)	189,924	220,050	258,158	299,109
Consolidated Rambler Mines Ltd., Newfoundland, Canada	10,463	10,828	11,859	15,393
Hudson Bay Mining & Smelting Co. Ltd., Canada	63,066	65,734	74,393	69,343
Lamaque, Canada (i)	54,901	62,157	62,061	57,364
U.S.A.				
The Anaconda Company, United States	14,180	20,193	20,624	15,201
ASARCO Incorporated, United States (b)	48,188	45,402	47,835	46,408
Carlin Gold Mining Co., United States	213,000	208,000	215,000	152,400
Cortez Gold Mine, United States	79,311	25,533	2,254	2,476
Days Mines, Inc., United States	n.a.	481	447	7,531
Delemar Silver Mine, United States (n)	—	—	10,089	17,664
Duval Corporation, United States	19,350	27,000	29,000	24,000
Hecla Mining Co., United States (e)	1,245	1,847	2,248	1,056
Homestake Mining Company, United States	304,877	318,487	304,769	285,513
Kennecott Copper Corp., United States (j)	244,145	237,260	200,964	218,350
Magma Copper Company, United States				
San Manuel Division	19,610	22,454	23,342	24,956
Superior Division	14,935	19,985	22,474	21,454
Phelps Dodge Corp., United States (g)	41,383	46,432	34,937	44,973
SOUTH AFRICA				
Blyvooruitzicht, Transvaal	842,581	748,119	660,424	628,242
Buffelsfontein, Transvaal	942,158	945,518	925,478	899,983
City Deep, Transvaal (1)	127,147	93,816	11,118	—
Doornfontein, Transvaal	440,076	387,641	397,255	403,968

5.4.2 GOLD PRODUCTION OF SOME MINING COMPANIES (Continued)

	TROY OUNCES			
	1975	1976	1977	1978
SOUTH AFRICA (Continued)				
Durban Roodeport Deep, Transvaal	229,656	255,123	241,465	272,584
East Daggafontein, Transvaal	57,637	69,809	—	—
East Rand Pty., Transvaal	366,136	354,639	320,913	337,917
Freddies Cons., Orange Free State	141,466	183,388	—	—
Free State Geduld, Orange Fr.St.	1,215,423	1,115,746	1,405,952	1,366,069
Grootvlei, Transvaal	165,303	180,282	211,497	194,952
Harmony, Orange Fr.St.	989,857	976,482	—	—
Hartebeestfontein, Transvaal	1,046,838	1,035,794	1,022,583	1,014,751
Libanon, Transvaal	342,810	330,789	449,339	430,701
Loraine, Orange Fr.St.	252,917	253,878	256,209	229,235
Marievale, Transvaal	128,121	113,826	110,701	87,029
President Brand, Orange Fr.St.	1,289,981	1,183,626	996,123	977,636
President Steyn, Orange Fr.St.	869,067	914,615	834,736	816,188
Randfontein, Transvaal	374,672	514,315	561,030	678,577
St. Helena, Orange Fr.St.	812,784	841,179	623,946	552,703
So. African Land & Explor., Transvaal	165,136	171,257	—	—
Stilfontein, Transvaal	470,590	528,188	527,336	533,091
Vaal Reefs, Transvaal	1,973,843	2,122,090	2,061,689	2,168,182
Venterspost, Transvaal	233,331	223,210	230,521	211,578
Vlakfontein, Transvaal	105,760	107,428	68,417	—
Welkom, Orange Fr.St.	437,565	431,846	444,436	420,368
Western Deep Levels	1,534,748	1,431,734	1,397,892	1,467,913
Western Holdings, Orange Fr.St.	1,324,819	1,204,164	1,144,669	1,044,520
Western Areas	725,983	734,452	690,437	745,370
West Driefontein, Transvaal	1,908,371	1,792,532	1,697,093	1,840,797
West Rand Consolidated, Transvaal	204,514	167,743	136,094	107,422
PAPUA—NEW GUINEA				
Bulolo, Papua, New Guinea	833	1,867	1,657	1,064
Australia				
Kalgoorlie Lake View Pty. Ltd., Australia	155,302	135,800	84,482	78,735
PHILIPPINES				
Benguet Consolidated, Inc., Philippines	127,296	111,861	108,107	106,900
GHANA				
Ashanti Goldfields Corp. Ltd., Ghana (a)	384,913	372,689	361,512	265,684

5.4.2 GOLD PRODUCTION OF SOME MINING COMPANIES (Continued)

	TROY OUNCES			
	1975	1976	1977	1978
BRAZIL				
Mineracao Morro Velho S.A., Brazil	117,644	112,928	117,084	123,056
COLOMBIA				
Mineros de Antioquia, Colombia	41,171	46,819	48,483	48,375
Mineros del Choco, Colombia	16,978	14,294	n.a.	n.a.
MEXICO				
Cia Fresnillo, S.A., Mexico	4,043	4,984	4,830	4,598
Compania Minera de Cananea, S.A., Mexico (d)	7,835	10,309	11,185	9,452
Industrial Minera Mexico, S.A., Mexico (h)	43,552	44,506	45,206	42,113
Negociacion Minera Snata Maria de la Paz y Anexas, S.A., Mexico	6,864	6,618	6,040	3,984
Real Del Monte Y Pachuca, Mexico	17,797	18,447	18,015	n.a.
ZAIRE				
Kilo-Moto, Zaire	79,831	n.a.	n.a.	n.a.
Sominki, Zaire	18,513	19,472	16,223	14,667
CHILE				
Codelco-Chile	28,187	31,920	35,537	32,987
Division Chuquicamata	9,502	14,717	(k)	(k)
Division Salvador	14,810	13,621	(k)	(k)
Division El Teniente	3,875	3,582	(k)	(k)
SWEDEN				
Boliden Metall AB, Sweden (f)	109,923	147,700	136,705	144,700

Source: American Bureau of Metal Statistics Inc.

(a) Year ended Sept. 30.

(b) Excludes production in Mexico.

(c) Includes production of Ross Mine, Ontario. Production stopped at Hollinger Mine in April of 1968.

(d) Rosario Resources own 27%.

(e) Includes Hecla's share of production from each mining property since date of acquisition of such property.

(f) Refined production.

(g) Refined production including production from custom or purchased ore.

(h) Includes only production of Monterey refinery.

5.4.2 GOLD PRODUCTION OF SOME MINING COMPANIES (Continued)

(i) Fiscal year ending September 30.

(j) Refined output for 1975, 1976 and 1977, previous years smelter production.

(k) No longer separately reported.

(l) Includes Consolidated Main Reef and Crown Mines.

(m) Acquired the Schumacher Division, Ontario, from McIntyre Porcupine Mines Limited Effective November 26, 1973.

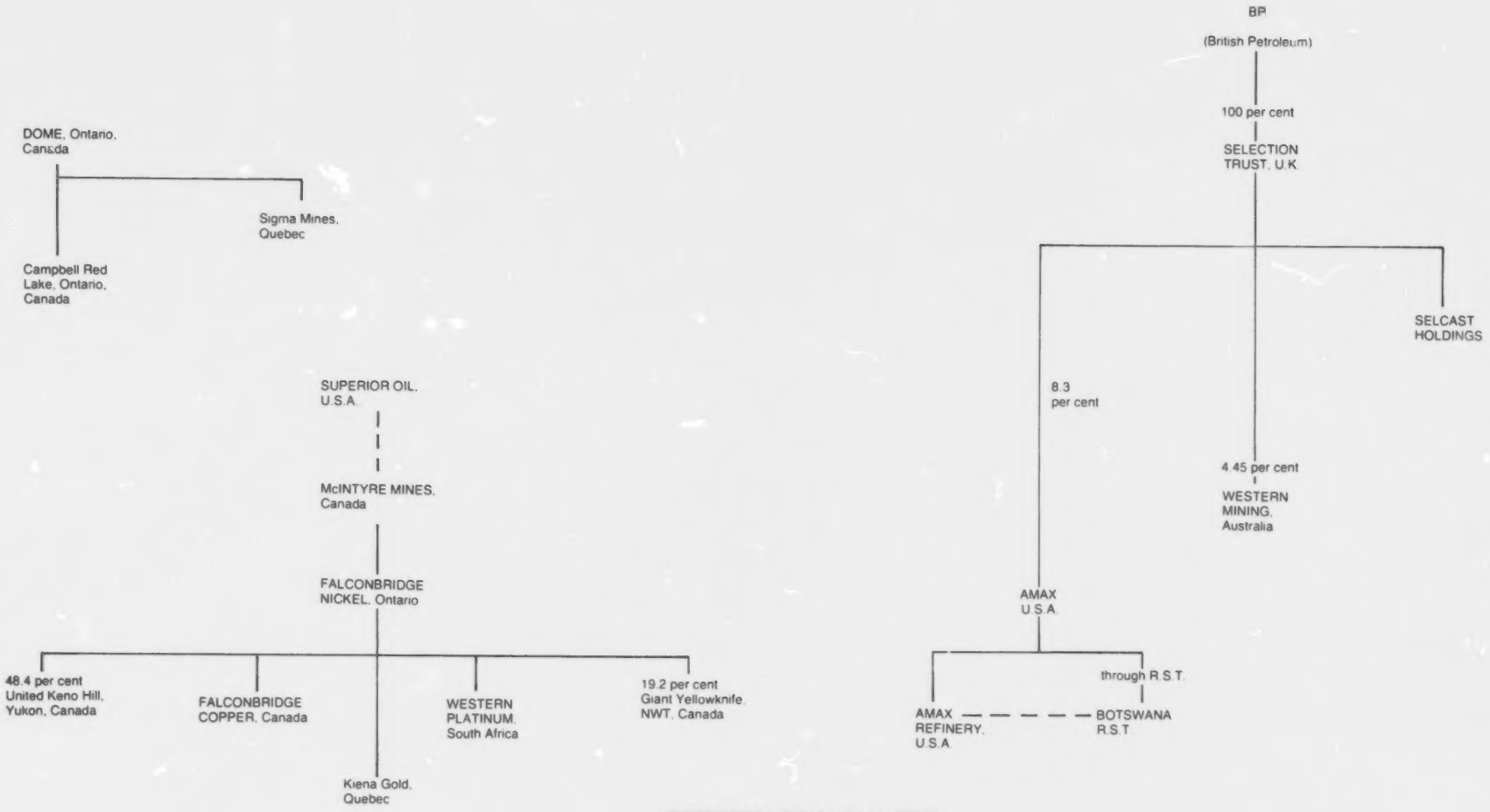
(n) Earth Resources owns 52.5% and Superior Oil Co. and Canadian Superior Oil Co. owns 47.5%. Superior Oil controls Falconbridge, Canada.

THE WORLD'S 20 LARGEST GOLD MINES

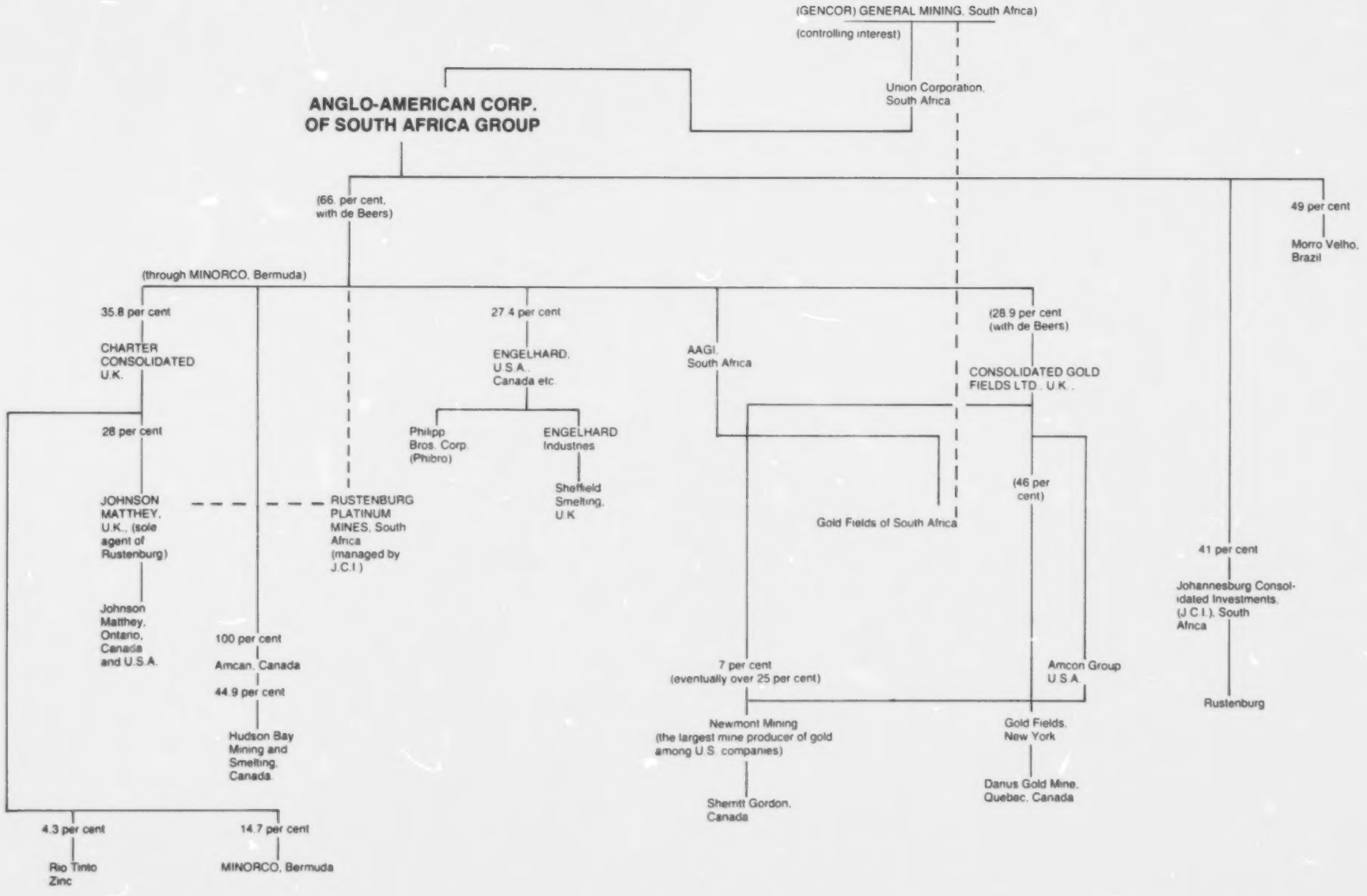
Mine	Company	Year	Million Tons Milled	Recovery	
				Grade g/ton	Tons Of Gold per year
Muruntau, U.S.S.R.	U.S.S.R. Ministry of Non-ferrous Metallurgy	1979	n.a.	2.0*	80.0e
Vaal Reefs, South Africa	Anglo American Corporation	1979	8.2	8.22	67.3
West Driefontein, South Africa	Gold Fields of South Africa	1979	2.6	21.8	56.0
East Driefontein, South Africa	Gold Fields of South Africa	1979	2.4	20.1	48.0
Western Deep, South Africa	Anglo American Corporation	1979	3.2	14.78	47.9
Free State Geduld, South Africa	Anglo American Corporation	1979	3.1	12.2	38.2
Hartebeestfontein, South Africa	Anglo American Corporation (1)	1980	2.8	11.2	32.2
Harmony, South Africa	Barlow Rand	1979	7.1	4.45	31.8
Western Holdings, South Africa	Anglo American Corporation	1979	3.2	9.91	31.3
President Brand, South Africa	Anglo American Corporation	1979	3.2	9.41	30.3
Kloof, South Africa	Gold Fields of South Africa Corporation	1979	2.0	14.8	29.4
Buffelsfontein, South Africa	Anglo American Corporation (2)	1979	3.2	8.46	26.6
President Steyn, South Africa	Anglo American Corporation	1979	3.6	7.11	25.4
Western Areas, South Africa	Johannesburg Consolidated Investment	1978	4.1	5.6	23.1
Randfontein, South Africa	Johannesburg Consolidated Investment	1978	1.9	11.4	21.2
Kal'makyr, Cu mine, Tashk., Uzbek.	U.S.S.R. Ministry of Non-ferrous Metallurgy	1977	23.0	1.0	17.3e
Bougainville	Rio Tinto Zinc	1979	36.2	0.75	19.7
Blyvooruitzicht, South Africa	Anglo American Corporation (3)	1979	1.9	9.98	19.1
St. Helena, South Africa	General Mining Union Corporation	1978	1.9	9.03	17.4
Stilfontein, South Africa	General Mining Union Corporation	1978	2.0	8.47	16.6

(e) Estimate: Gold 1979 and Gold 1980 (Consolidated Gold Fields); (1) Managed by Anglo Vaal; (2) Managed by General Mining; (3) Managed by Barlow Rand; Year in Column 3 refers to the company annual report of that year.

* 100 to 300 g. silver per ton.



ESSENTIAL FINANCIAL TIES OF THE GOLD PRODUCING INDUSTRY—1980


(GENCOR) GENERAL MINING, South Africa)
(controlling interest)
Union Corporation, South Africa
ANGLO-AMERICAN CORP. OF SOUTH AFRICA GROUP
(66. per cent, with de Beers)
49 per cent
Morro Velho, Brazil
(through MINORCO, Bermuda)
35.8 per cent
CHARTER CONSOLIDATED U.K.
28 per cent
JOHNSON MATTHEY, U.K., (sole agent of Rustenburg)
Johnson Matthey, Ontario, Canada and U.S.A.
RUSTENBURG PLATINUM MINES, South Africa (managed by J.C.I.)
100 per cent
Amcan, Canada
44.9 per cent
Hudson Bay Mining and Smelting, Canada.
4.3 per cent
Rio Tinto Zinc
14.7 per cent
MINORCO, Bermuda
27.4 per cent
ENGELHARD, U.S.A., Canada etc.
Philipp Bros. Corp. (Phibro)
ENGELHARD Industries
Sheffield Smelting, U.K.
AAGI, South Africa
(28.9 per cent (with de Beers)
CONSOLIDATED GOLD FIELDS LTD., U.K.,
(46 per cent)
Gold Fields of South Africa
7 per cent (eventually over 25 per cent)
Newmont Mining (the largest mine producer of gold among U.S. companies)
Sherritt Gordon, Canada
Amcon Group U.S.A.
Gold Fields, New York
Danus Gold Mine, Quebec, Canada
41 per cent
Johannesburg Consolidated Investments, (J.C.I.), South Africa
Rustenburg

5.5 AVAILABILITY—WORLD

Production of gold from the world's mines was probably about 1,200 metric tons in 1979, some of which was refined in 1980. World mine production of gold has fallen dramatically since 1970, mainly as a result of mine difficulties in the Soviet Union and the Republic of South Africa. South African gold mines have reduced overall production steadily since 1970.

OVER HALF OF ALL THE GOLD THAT HAS EVER BEEN MINED IN THE HISTORY OF THE WORLD HAS BEEN MINED SINCE 1945, THE END OF WORLD WAR II. OVER THREE QUARTERS OF ALL OF THE GOLD EVER MINED IN WORLD HISTORY HAS BEEN MINED DURING THIS CENTURY.

Relatively little of this very large quantity has been lost.

If all the gold metal that exists in the world today—including your ring, your watch, your bracelet etc.—accumulated over about six thousand years, were melted together as pure gold, it would make a cube measuring only 54 feet per side, or about one tenth of the size of the Washington monument. 50,000 tons of gold could be contained in a cube of 45 feet each side.

Influences on the Availability and Price of Gold

1811-1812 The gold reserves of the British banks prevented the collapse of the price structure, following the first anti-industrial riots by machine breakers, or Luddites.

1812 Napoleon's armies destroyed in the retreat from Russia. Allies occupy France. U.S. declares war on Britain, invades Canada and burns down York, (now called Toronto, Ontario).

1814 British burn down Washington, D.C.

1816 One year after the Battle of Waterloo, Britain adopted gold as the basis of its monetary system.

1820 Altai, Siberia, alluvial deposits of gold exploited.

1822 Brazil independent from Portugal.

1829 Lena river, Siberia, placer deposits first exploited.

1834 Great importation of gold into New York.

1836 Great Trek of Boers, (Dutch-speaking white settlers), north from British South African territory.

1840 Union Act gives Canada, (then Ontario plus Quebec), responsible government. Yenisei Ridge gold deposits started output in Russia.

1847 Gold discovered in California.

1848 U.S.A. makes great territorial gains from Mexico; Mexico cedes California and New Mexico to the U.S.A.
Orange Free State founded by the Boers. (Later a huge gold producer.)
British troops drive the Boers across the Vaal river, (trans Vaal) and annex Orange Free State.
Chlorination process for refining gold introduced, enabling extraction of more gold from ores; at one time extensively used in Australia.

1849 Bruce copper mines, Ontario, Canada, first worked—contained small amounts of gold.
Californian gold rush at its height, ("the 49-ers"). First importation of Californian gold into U.K.
Transvaal founded by the Boers. (Later a huge gold producer.)

1801-1850 Average world output of gold: 23.7 metric tons per annum.

1851 Discovery of gold in Australia.

1851-1853 California gold inflation.

1852 Transvaal independence recognized by Britain.

1854 Crimean War, Britain and France in Southern Russia.

1858 Discovery of placer gold deposits in British Columbia; is made a colony of Britain.

1860 U.S. Civil War.

1861 Gold discovered in New Zealand.

1863 Big gold discovery by Russia on the Bodaibo, Tributary of the Lena river in Russian Far East.
Large exports of gold from U.K. to European continent to pay for silver.

1866 GOLD DISCOVERED NEAR MADOC, ONTARIO, CANADA. The first lode gold discovery in the Canadian Precambrian Shield at the Richardson Mine. Production was about 85 oz. of gold.
Bank of England declined to sell gold. Financial panic. "Black Friday".

1867 Dominion of Canada established. Russia sold Alaska (later a gold producer) to the U.S.A.—a measure directed against Britain. Amur river system gold output started in Russia.
Diamonds discovered in South Africa. (The diamond mines later funded the large gold mines of the Rand. The industries are still interlocked.)

1866-1868 Russia subjugated the Bokhara Khanate, (where the two largest Soviet gold-producing mines are now operating), now Uzbekistan, Soviet Central Asia. British-Russian rivalry intensified.

1869 Financial "Black Friday" in New York caused by gold corner, September 24.
Canada purchases the vast North West Territories, (later an important gold producer), from the Hudson's Bay Company, part of which later became Northern Ontario.

1870 Invasion of France by Prussia. Russian Far East deposits worked.

1870-1871 Second South African diamond rush; the large Kimberley mine discovered.

1871 First recorded discovery of gold in Northwestern Ontario at the Moss Mine.

Very large exports of gold from U.K. to the "Hanse" cities in Germany. German Empire proclaimed.

British Columbia becomes a province of Canada.

1872 Gold discovered on island in Partridge Lake, followed by many others in the Lake of the Woods area, NW Ontario.

1873 Large silver deposits discovered in Nevada.

1874 Enormous increase of bullion in the Bank of France—mostly gold.

Gold discovered in the Black Hills of South Dakota, U.S.A. Vast new influx of white prospectors etc. Resolute resistance by the Dakota-Sioux. (Largest U.S. gold mine, Homestake, is still producing.)

1875 Large export of gold to Germany from U.K.

GOLD FOUND IN THE DE KAAP VALLEY, TRANSVAAL, SOUTH AFRICA.

1876 Sioux annihilate troops under Colonel George Custer.

1877 Transvaal annexed to British Empire.

1878 Britain warns Zulus not to threaten the Transvaal.

1879 British troops wiped out at Isandhlwana. Later, the Zulus were defeated at Rorke's Drift and Ulundi.

Marked diminution in gold production of California mines.

1880 Transvaal declares independence from Britain and proclaims itself a republic under Paul Kruger.

1881 Boers defeat British troops at Laing's Neck and Majuba Hill. Independence of Transvaal recognized by Britain again.

1883 Completion of Italian order for gold.

1851-1885 Average world output of gold: 182.4 metric tons per annum.

1885 Canadian transcontinental CP railroad completed to British Columbia from Montreal.

1886 GOLD DISCOVERED IN ALMOST UNBELIEVABLE QUANTITIES IN TRANSVAAL, IN THE WITWATERSRAND, (RAND). The Rand declared a gold field. Johannesburg founded.

Gold found at Fortymile, Alaska, U.S.A.

(The discoveries in California, Canada, Alaska, Russia, Australia and South Africa increased the world gold supply massively.)

1888 Cecil Rhodes, diamond millionaire, secures concession from the Matabele tribe to search and mine for gold in the ancient rich gold-bearing areas of what is now Zimbabwe, which, with Zambia, was known for almost 90 years as Rhodesia.

1890-1909 Gold mining boom in the Lake of the Woods area of North-western Ontario—chief mines: Wendigo, Mikado, Sultana, Regina.

1891 Cyanide process for refining gold introduced, enabling extraction of more gold from ores.

Sultana gold mine began operation, Lake of the Woods.

1892 Ophir gold mine, (later Havilah), Galbraith township, east of Sault Ste. Marie, worked 1892-1902 and 1910 and 1911.

Discovery of gold at Coolgardie, West Australia.

1893 Mikado gold site discovered, NW Ontario, Lake of the Woods.

1895 Regina, (later Black Eagle), gold mine commenced output, Lake of the Woods.

1895-1896 Gold discovered on north shore of Lake Superior at Jackfish and Schreiber, Ontario.

1896 Klondike, placer gold rush begins in Canada.

1897 FIRST GOLD BOOM IN NW ONTARIO PEAKED. GOLD FOUND SOUTH OF WAWA LAKE, MICHIPICOTEN. CORDOVA MINE DISCOVERED IN SE ONTARIO.

1898 Border dispute between Ontario and Manitoba was decided by the Privy Council in favour of Ontario. It had delayed the opening up of gold development in the Lake of the Woods and Seine river areas.

1899 Boer War in South Africa begins.

30,000 persons in gold rush in the Klondike, Yukon Territory, Canada.

1900 Annexation of the Transvaal Republic and Orange Free State by Britain. Johannesburg occupied.

1901 Dominion status granted to Australia.

1902 End of Boer War. Britain in control of the gold mines.

1903 Discovery of rich silver deposits at Cobalt led to intensive exploration of the Shield and the discovery of important gold camps in Ontario, i.e. Larder Lake, Porcupine, Kirkland Lake.

Laurentian gold mine, Lake Manitou, NW Ontario, commenced operations, South of Dryden.

Canada—Alaska frontier fixed.

1905 Exports of gold from the ancient gold workings in Rhodesia, Zimbabwe, commenced.

South Africa becomes the most important source of gold in the world.

1906 Abitibi and Larder Lake gold areas discovered.

1907 Night Hawk Lake gold deposit discovered in N Eastern Ontario, Porcupine area.

Dominion status granted to Newfoundland and New Zealand.

1908 Painkiller gold area discovered, 1907-08.

Large U.K. gold exports to Paris.

1909 Gold discovered at Dome site, Porcupine, NE Ontario.

1910 Gold discovered at Swastika, NE Ontario.

1911-1912 Gold Rush at Kirkland Lake, NE Ontario; West Shiningtree discovered.

1912 Rupert's Land north of Ontario granted to Ontario.

1913 By 1913, the fur trade and gold yields of Alaska, (U.S. purchase of 46 years before), were bringing in profits of U.S.$81 million.
Balkan War.

1914 Ontario becomes the principal producer of gold in Canada.
World War I broke out.
Boston Creek, Ontario, gold area discovered; Kowkash-Tashota in 1915; Elstone-Dunkin and Matachewan in 1916, Rickard and Lightning River in 1917 and Bourkes, 1916-1918.

1917 Russian Tsar abdicated. Revolution. Soviets take over Russia.

1918 End of World War I. Austrian Empire broken up. Germany's colonies given to others. Turkish Empire broken up. Arab states created.
Gold discovered East of Goudreau on Algoma Central railway.

1921 Rich gold in quartz discovery on Murphy claims, 3.5 miles SW of Goudreau—became Goudreau Gold Mines.

1922 General strike in South African gold mines.
Great increase in Italian demand for gold. German mark completely valueless.

1924 Hollinger, NE Ontario, the greatest gold mine in Canada.
Aldan plateau gold placer deposits discovered in southern Yakutia, Soviet Far East, the coldest land in the Northern Hemisphere.

1925 GOLD DISCOVERED AT RED LAKE, ONTARIO.

1925-1926 Gold Rush in the Red Lake area, NW Ontario.

1928 Discovery of gold at Pickle Lake in Northwestern Ontario.

1929 World Economic Crisis.
Heavy drain of gold to France and Germany from U.K.
U.S. stock market collapse.

1931 First discovery of gold in the Beardmore-Geraldton Belt in Northwestern Ontario.
Heavy drain of gold from U.K. to European continent.
Large movement of gold from India to England began. From September, 1931 to end-1932, 14.5 million ounces of fine gold exported from India.

1932 High gold price.

1933 Major gold placer production commenced on the Upper Kolyma and Indigirka rivers which empty into the Arctic Ocean, Soviet Far East.
Newfoundland abandoned the status of a dominion owing to fiscal difficulties and became a crown colony; (joined Canada in 1949).

1933-1934 First discovery of gold in the Yellowknife gold camp of the Northwest Territories, Canada.

1934 Gold Price U.S.$35 per ounce; New price of gold fixed by U.S. President Franklin D. Roosevelt.
U.S.A. returns to the gold standard. Would buy gold from any quarter. U.S. dollar devalued by 59.06 per cent. INCREASE IN GOLD MINING IN ONTARIO.
The Honourable C. McCrea, the Minister of Mines for Ontario, stated on February 8, 1934: "Profits from mining will increase and dividends enlarge. . . . Ontario's position as a gold mining province was assured under the old standard value of gold at $20.67 per ounce—it is doubly assured under gold at $35.00".

1934-1972 NO CHANGE IN OFFICIAL GOLD PRICE for 38 years. U.S. economy dominant in the world.

1936 Pamour gold mine at Porcupine, Ontario commenced production.
World mine production of gold that year exceeded 1,000 metric tons—the first time in history. This level lasted for several years through 1942.

1938 Heavy purchases of gold by European continental operators.

1939 World War II broke out.

1940 New South African mining fields commence output-Orange Free State, Evander and Western Areas.

1945 World War II ends. U.S. occupation of Japan. Japan's colonies taken away. Italy's colonies redistributed. Soviet boundaries greatly extended.

1946 Worldwide shortage of food.
End of U S. OPD price controls and release of wartime pent-up demand.

1947 Continued post-War expansion of demand.

1947-1948 Break-up of the British Empire commences. India, Pakistan, Burman and Ceylon independent.

1948 Surge in jewellery demand, combined with curtailment of output by producers.

1949 Canada's richest gold mine, Campbell Red Lake, Ontario commenced production.
Irish Free State becomes a Republic—leaves British Commonwealth. Economic recession. U.K. pound devalued.
Newfoundland joins Canada.
Communists take over China.

1950 Korean War broke out. French gold reserve revalued. Canadian dollar freed.

1951-1953 Korean War price controls.

1953 Armistice in Korea. Large amounts of Russian gold consigned to London.

1954 London Gold Market reopened.
U.S. economic recession.

1959 Rush of speculative gold buying on rumours of U.S. dollar devaluation.
World mine output of gold again exceeds 1,000 metric tons and this level was maintained until 1973. It has never exceeded it since.

1961 South Africa, the world's largest gold producer,

	becomes a Republic—leaves British Commonwealth.
1965-1966	Heavy buying of gold due to currency fears.
1967	June: 6 Day War, Israel vs. Arabs.
	Gold in heavy demand late in the year.
	U.S. silver policy change; devaluation of the Pound Sterling and speculative buying as a monetary and inflation hedge.
1968	"Gold Pool" abandoned. Free gold market permitted under two-tier system. Continued shortage of gold. Japan becomes the third largest industrial nation in the world.
1969	Decline in free gold price; easing of supply/demand balance. Mild U.S. recession lasting through 1970. President Nixon announced a phased withdrawal of U.S. troops from Vietnam. There were then 550,000 U.S. soldiers there.
1970	Gold price falls to U.S.$33 an ounce. U.S. economic recession continues.
	Extension of the war to Cambodia, (Khmer).
1971	Level gold prices. Supply/demand balance.
	President Nixon shuts the gold window.
	U.S.A. suspends conversion of dollars into gold on August 15. U.S. dollar devalued by 7.0 per cent on December 18.
	Sales of gold by the U.S.S.R. recommence.
	South Vietnamese, with U.S. air support advance into Laos.
1972	Rise in the gold price.
	Increased gold consumption by industry.
	U.S. ground forces in Viet Nam War now 69,000 men.
1973	Continued rise in gold price. It went over U.S.$100/ounce for the first time in May.
	Second U.S. dollar devaluation.
	U.S. dollar devalued by another 10 per cent.
	Two-tier gold system terminated in November.
	October war in the Middle East. Arab nations embargo oil exports to the U.S.A. for six months.
1974	Discovery of major gold deposit by Amoco in the Detour Lake area of Northeastern Ontario, Canada.
	World crude oil prices quadruple between October, 1973 and March, 1974.
	Very substantial rise in the gold price. By the end of 1974, the gold price had risen to U.S.$198 an ounce.
	U.S.A. legalises gold ownership by U.S. citizens.
	Speculative buying as a monetary and inflation hedge followed by a severe U.S. economic recession, lasting to 1976.
	Gasoline prices much higher.
	Boom in metal prices.
1975	Major drop. Slight easing of the U.S. economic recession. First U.S. government auction of gold.
	Soviet grain crop failure; output fell to 140 million tons.
	Saigon falls to the Communists.
	Viet Nam War ended in April.
1976	I.M.F. begins regular gold sales. Gold falls to U.S.$103 an ounce.
	"Bottoming-out" of U.S. recession.
1977	Small rise in gold price.
	I.M.F. starts restitution of some gold to members.
	Continued economic recovery.
1978	Major rise in gold price commences. Record price of U.S.$200/ounce in July.
	End of the "official" gold price.
	President Carter announces massive dollar support program, including U.S. gold sales. U.S. government gold auctions restart.
	Inflationary expectations and U.S. dollar weakness.
	Revolution in Iran results in a slowdown in the output of that major producer's oil production.
1979	Anxiety buying of oil induced by the Iranian cut-off causes world oil prices to double.
	Record gold prices. U.S.$300/ounce in July, 1979. Boom in precious metal prices.
	U.S. and I.M.F. reduce monthly gold sales.
	Soviet grain crop problems again, output only 185 million tons, estimated.
	U.S. recession begins.
	November: Gold price goes to over U.S.$400 an ounce.
1980	Only a small tonnage of Soviet gold sold to the West during the year.
	Gold price went to over $800 and fell back; settled in the $500-$600 range.
	Iran-Iraq war begins; their oil exports reduced.
	Boom in precious metal prices continues.
1981	Announcement that the large Detour Lake gold deposit in Ontario is to be put into production, with output commencing in 1983. Probably the single largest gold operation ever in Canada.
	President Reagan scrapped price controls on oil.

Source: Ontario Mineral Resources Branch.

5.6 CANADA AND ONTARIO

Canada and Latin America, particularly Brazil, as well as Australia and Zimbabwe, are the last real frontiers of gold.

Canada is the world's third largest mine source of gold and Ontario is by far the largest mine producer of gold among the Provinces. Canada's so-called "Gold Belt" runs from just west of the Manitoba/Ontario border across Northern Ontario into Northern Quebec.

Jacques Cartier, 1492-1557, Explorer of Canada, was commissioned by King Francis I of France to sail in search of gold, spices and a new route to Asia. He entered the St. Lawrence river in 1534. Sir Martin Frobisher, 1535-94, failed to find gold exploring Canada's northeast coasts from 1576 onwards.

5.7 Canada—Gold Output

	1978	1979	1980e	1981e	1982e
Gold—Output (metric tons)	53.967	49.175	50.	54.	63.

e—estimated

Canada's gold production is now around 50 metric tons a year but two major gold mines have large expansions under way and new mines are coming in. Some Canadian and Ontario gold is a byproduct of nickel and other base metal mining. Almost one-third of Canada's mine output of gold is recovered as a byproduct of other metal mining, (1978).

From 1932 through 1951, gold was Canada's most valuable mineral commodity in aggregate dollars.

The Canadian gold mining industry has been adjusting to a free market situation after the period of over-expansion caused by the establishment in 1934 of a fixed high price of $35 per ounce for gold and the subsidies of the 1950's and 1960's. The stimulating effect is better understood when one grasps that that price was equivalent in purchasing power in 1934 to about *$185* per ounce in 1976 dollars or *$115* per ounce in constant 1971 dollars. During the period between the end of World War II and 1971, inflation reduced the revenue per ounce from about *$85* to *$35* in 1971 dollars but most of the Canadian gold mining industry received Federal government assistance under the Emergency Gold Mining Assistance Act.

Canada's gold production peaked in 1941 at 166 metric tons.

Canadian gold production has declined steadily for years. There were 278 gold mines in Canada in 1940, 122 in 1949, 14 in 1975 but 21 in 1979. In 1940, the top 20 mine producers of gold in Canada averaged 3.77 metric tons a year each. (There have, of course, been amalgamations that have artificially reduced the number, e.g. "Pamour" now includes the Aunor, Hallnor, McIntyre, Hollinger mines.) Pamour also receives mill feed from other deposits.

Exploration for gold in Canada greatly declined as costs escalated and the world price remained fixed. Gold mines have traditionally operated with a three-year declared reserve, or even less.

As Malcolm Slack, Vice President of Pamour Porcupine Gold Mines, Ontario, has written so clearly:

> "The drop in Canadian gold production does not reflect the maturing and decline of a non-renewable resource industry, but rather the lack of any significant exploration and development activity over a 35-year period."
>
> "Had our favourable gold environments received the intense activity that base metals have, Canadian gold production would be several times the present level."
>
> "However, operating gold mines which have virtually no reserves to report display a remarkable record of longevity in the Canadian mining industry."

New programs of the Ontario Geological Survey and Ontario universities, funded largely by the Government of Ontario in the millions of dollars, are being undertaken and applied.

The Ontario Government is also funding several millions of dollars a year in tax free grants and tax credits to non-mining companies and individuals under the new, (September, 1980), Ontario Mineral Exploration Program.

Canada mines over 60 per cent more gold than the U.S.A., but output has been falling in both countries until quite recently.

(Canadian industry consumes only about 8 tons of gold a year, compared to a mine production of about 50 tons a year.)

5.8 ONTARIO

ONTARIO MINES ARE ABOUT TWO-THIRDS OF THE AMOUNT WHICH THE ENTIRE UNITED STATES PRODUCES. ONTARIO BY ITSELF WOULD RANK SIXTH IN WORLD GOLD OUTPUT SINCE IT PRODUCES MORE GOLD THAN PAPUA-NEW GUINEA, OR THE PHILIPPINES, OR AUSTRALIA ETC. ONTARIO GOLD OUTPUT IS RISING.

Ontario's metal mining industry produces in value terms between 40 and 50 per cent of the value produced by the U.S. metal mines—that's just Ontario, not the whole of Canada.

Most of Ontario's gold output comes from the mines of Campbell Red Lake, Dome, Kerr Addison, Dickenson, Pamour, Macassa Division of Willroy Mines, International Nickel and Falconbridge.

Ontario's mine output of gold could increase markedly in the next few years. 1979 and 1980 developments in the gold market, combined with the current U.S./Canadian dollar relationship, have led to significant revivals in Northern Ontario gold mining.

MAIN GOLD PRODUCERS—ONTARIO

	(metric tons)					
	1976	1977	1978	1979	1980e	1981e
Campbell Red Lake	5.7	5.9	5.7	5.7	5.8	6.0e
Pamour	4.8	5.1	5.0	4.2	3.5	3.4e
Dome Mines, South Porcupine	3.7	2.9	2.9	3.0	2.65	n.a.
Kerr Addison	3.4	3.3	2.6	1.9	2.0	n.a.
Willroy	1.6	1.7	1.7	1.6	1.6	n.a.
Dickenson	1.7	1.9	1.9	1.4	1.0	n.a. (up to 2 tons in 1982)
Inco		1977 (cutback in production) Output is now over 1 metric ton per annum in a typical year.				
Total Ontario Mine Output of Gold	23.00	22.99	21.8	19.17	18.5e	20.0e

e—estimated by T. P. Mohide

Considerable expansions of existing mines are under way and new multi-million dollar gold mines and reopenings are under development in Ontario. These are detailed further on in this chapter.

THE ABOVE ONTARIO GOLD OUTPUT SHOULD THEREFORE INCREASE CONSIDERABLY THROUGH 1985.

History—Ontario Gold Mines

Gold has been mined in Ontario for a very long time. There were early gold discoveries near Madoc, Ontario in 1866 and in Northwestern Ontario in 1871, (the Moss mine). Gold was discovered south of Wawa, NE Ontario in 1897, the year in which the first gold boom in Northwestern Ontario peaked. The first gold camp of any importance in Northern Ontario was in the Lake of the Woods area and the gold boom continued to 1900.

In the 1880's, there was a dispute between the Canadian Federal government and the Province of Ontario over 100,000 square miles of rich mineral land north of the Great Lakes, now known as Northern Ontario. The province gained the victory and the decision virtually doubled the size of Ontario. The Prime Minister, (Sir) John A. MacDonald, greatly exacerbated the dispute between the Provinces one hundred years ago in 1881, by extending Manitoba's border to the East of Thunder Bay, (comprising Fort William and Fort Arthur, or Prince Arthur's Landing). This move took some 85,000 miles of Ontario's territory.

Conflicting jurisdictions were set up. For example, in Kenora, both Manitoba and Ontario set up provincial courts and provincial police and in 1883 both Provinces held elections in the same territory.

Kenora and Thunder Bay are now in Ontario.

In the 1870's the serious boundary dispute between Ontario and the Federal government in Ottawa about the borderline between Manitoba and Northwestern Ontario delayed the opening up of gold development in the Lake of the Woods and Seine river areas. It nearly brought about an armed clash between the authorities of the two Provinces. In 1898, the Privy Council decided the line in favour of Ontario and confirmed the right of the Province to the ownership of land, timber and minerals in the area, and cleared the way for licensed exploration. (In that part of Ontario, Fort Kaministikwia had been founded by La Verendrye in 1679 near the junction of the Kaministikwia and Shebandowan rivers, north of present day Thunder Bay, Ontario. Further west, Fort Pierre, near the present Fort Frances, Ontario, across the Rainy River from the U.S.A., (Minnesota), had been founded in 1718.) Ontario reached its present size in 1912.

In the Red Lake area of NW Ontario, in 1897, the Northwest Ontario Exploration Company sank a small shaft at Slate Bay with indifferent results.

The first passenger-freight trains had arrived in North Bay, Northeastern Ontario, by 1882. Up to 57 miles of the new Temiskaming and Northern Ontario railway out of North Bay was complete by late 1903. At one mileage point, it passed directly over rich silver veins and on August 7, 1903, McKinley and Darragh found silver flakes at what is now Cobalt Lake.

The silver rush at Cobalt, Ontario, just west of the Quebec border, resulted from this rail development, as well as the important Kirkland Lake gold finds, a little further north. (Railroad construction had also led to the 1883 discovery of nickel, copper, gold and other metals at Sudbury.)

The earliest viable discovery of gold in the Porcupine area, 60 miles to the Northwest of Kirkland Lake, was made in 1907 on Gold Island in Night Hawk Lake and later in the year a nearby property was staked and became the Night Hawk Peninsula mine which produced $500,000 worth of gold between 1924 and 1944, mostly sold for U.S.$35 an ounce.

In 1909, the "dome" of gold was discovered in the Porcupine area and the Dome Mines Company Ltd. was incorporated in 1910; production began in 1910 with 214 ounces of gold that year.

In 1911, the Kirkland Lake area of Ontario had its first gold rush. It can claim that the town's main street is literally paved with gold—a road crew accidentally used a pile of gold-bearing ore instead of waste rock and nobody noticed until too late, when the surfacing had been completed.

In 1914, Ontario became the principal mine source of gold in Canada and produced 74 per cent of Canada's gold output in 1920.

There was a gold rush at Red Lake in 1926, as a result of activity beginning in 1922.

More than any other resource commodity, (whether from metal mines or forests), gold has acted as the major catalyst in opening up Northern Ontario and in continuing the development over the years.

The origin of a period of exceptional prosperity for the Northern Ontario gold mining industry is found in 1934. Under the U.S. Gold Reserve Act, on January 31, 1934, President Roosevelt increased the price of gold from $20.67, fixing it at U.S.$35 per troy ounce, (a devaluation of the U.S. dollar to 59.06 cents in terms of its former gold parity), with a guarantee to governments of U.S. dollar convertibility to gold; the U.S.A. would buy at that price with no limit. It remained at that price level for 39 years.

THIS STIMULATED GOLD MINING WORLD-WIDE ALMOST BEYOND IMAGINATION. *CANADA AND NORTHERN ONTARIO* BENEFITTED GREATLY FROM THIS TREMENDOUS INCREASE IN THE PRICE. For Northern Ontario in 1934 this meant an enormous increase in income from gold—an increase of something like 70 per cent. The result was a rush in Northern Ontario to open up new gold mines, because there was now much more money in it.

The Honourable C. McCrea, Minister of Mines of Ontario, stated on February 8, 1934: "Profits from mining will increase and dividends enlarge . . . Ontario's position as a gold mining Province was assured under the old standard value of $20.67 per ounce—it is doubly assured under gold at $35.00."

Old properties were enlarged and new mines were discovered and speedily developed. Ontario mines produced 101.45 metric tons of gold in 1940, compared to 53 metric tons in 1930.

This expansion created for Canada essential foreign credits both before and after the outbreak of World War II in 1939.

In the six years, 1934-1939, prior to the start of World War II, approximately 65 new gold mines or reopened previous producers began production in Ontario.

Noranda Mines, (which was to become a giant corporation), had been incorporated in 1922. In 1934, Noranda acquired control of the Pamour mine in the Porcupine area of NE Ontario. Pamour's first gold production was in 1936. Hallnor gold mine followed and then Aunor, (Au for "gold", Nor for Noranda). In the same area, the McIntyre mine was purchased for Pamour in 1973. In 1976, Pamour purchased the main Hollinger property which adjoins the Schumacher mine, as well as acquiring the Ross mine in Holtyre.

The following tabulation illustrates the progress in production, employment, wages paid annually and annual cost of process supplies, including fuel and electricity, for the Ontario gold mining industry during the period 1907-1943 inclusive. Five year intervals are shown to the end of 1937, with one year intervals from 1939 to 1943 inclusive. Figures for the latter years are given to indicate the effect of the war on the industry.

ONTARIO GOLD MINES PRODUCTION, EMPLOYMENT AND COST OF PROCESS SUPPLIES, ETC.—1907-1943 INCLUSIVE

(FROM RECORDS, ONTARIO DEPARTMENT OF MINES)

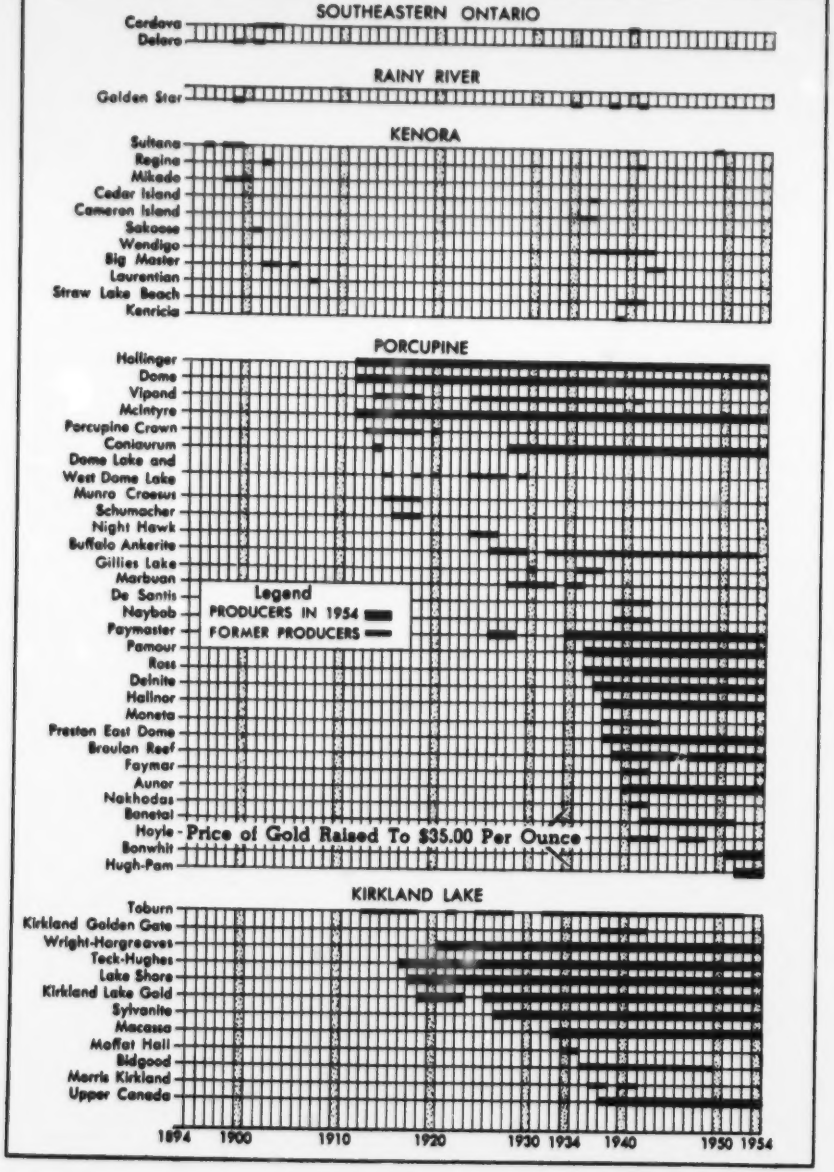
Year	Tons Ore Milled	Production $	Number Wage Earners	Wages Paid $	Process Supplies, Fuel and Electricity
1907	13,107	66,560	138	115,207	Not Available Prior to 1937
1912	156,122	1,187,987	955	1,023,097	
1917	1,230,321	8,757,758	2,561	3,220,097	
1922	2,268,736	20,856,913	3,919	5,285,521	
1927	4,286,553	33,733,087	5,963	9,520,937	
1932	5,497,076	53,066,616	8,460	13,509,649	13,378,904
1937	8,426,898	88,094,219	14,783	24,939,665	17,453,707
1939	10,723,129	109,595,837	18,241	31,641,437	18,768,942
1940	11,768,273	122,618,046	18,611	32,670,051	19,218,110
1941	12,225,234	120,623,258	19,362	35,956,340	15,934,981
1942	10,225,234	104,213,415	15,561	30,893,523	Not Available
Est. 1943	8,102,805	79,338,952	11,263	22,602,482	

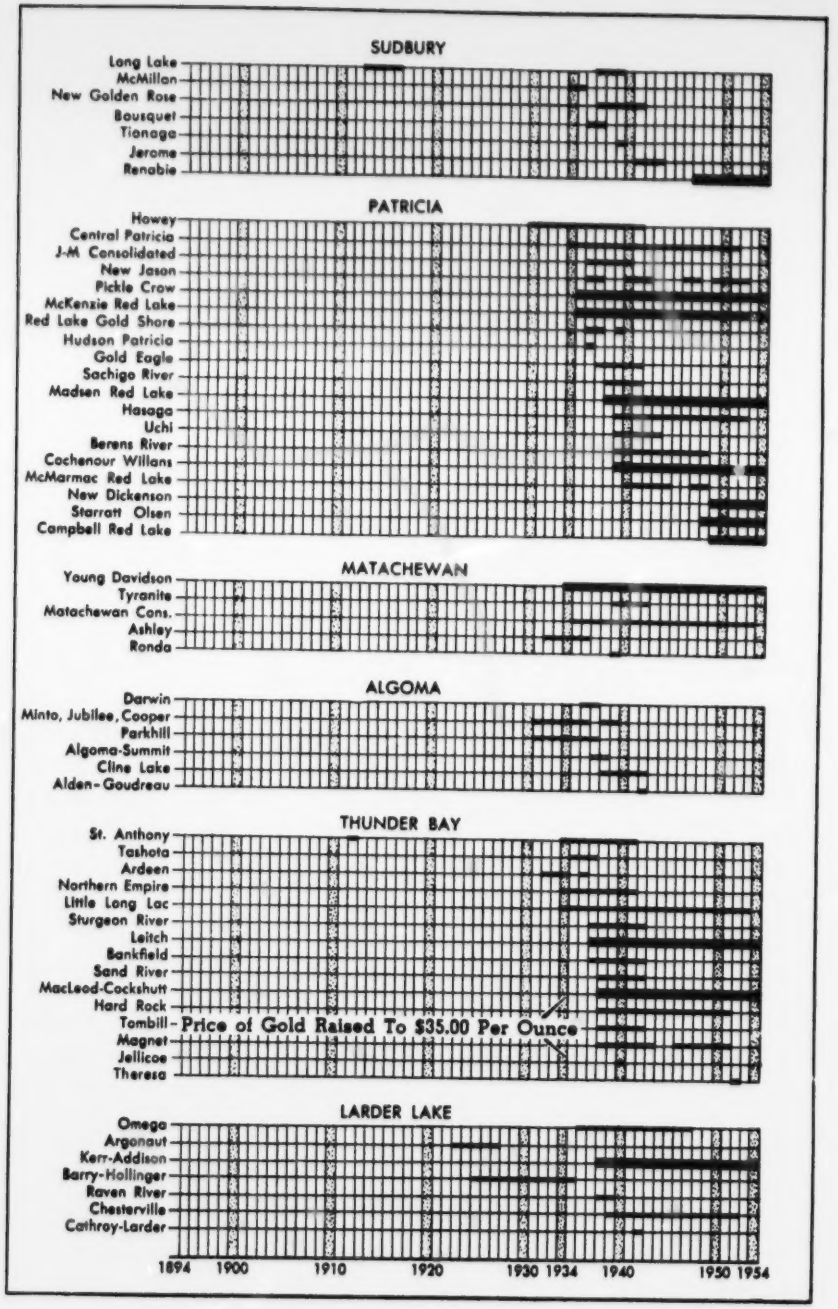
Note: Between the years 1932 and 1937, the price of gold was increased to $35.00 an ounce U.S., which accounts for the sharp increase shown in gold production in 1937 over that reported five years previously in 1932.

ONTARIO GOLD MINES

YEARS IN PRODUCTION, 1894-1954

With Production exceeding $50,000 in years shown.





It will be noted from the above table that gold mine production reached an all time high in 1940. This followed the request of the Dominion Government for increased production for the purpose of providing exchange to facilitate purchase of war materials from the United States. The Canadian need for U.S. Dollars to pay for vital war material was most acute between 1939 and 1943 and the gold mines received priority for labour and supplies. Later, the requirements for gold for this purpose were greatly reduced following reciprocal arrangements between Canada and the United States as a war time emergency measure. By October, 1942, gold mining was classed as a "non-war" industry. In the remaining war years through 1945, mine production of gold fell steeply because of acute shortages of equipment, materials and labour, (with wartime increases in wages and prices.)

The Royal Ontario Mining Commission, comprising

Norman C. Urquhart	Homer W. Sutcliffe
Kenneth C. Gray	H. Chipman McCloskey
J. Roy Gordon	Charles G. Williams
Robert J. Jowsey	J. Henry Jessup

was formed in 1943 to study the problems of the mining industry and reported in 1944 to the Honourable Leslie M. Frost, Minister of Mines.

The rich Campbell Red Lake gold mine in Northwestern Ontario first achieved gold production in 1949. (In 1977 alone, Campbell recovered nearly 6 metric tons of gold.)

The nearby Dickenson Red Lake Mines, incorporated in 1944, also saw its first gold bar poured early in 1949. Robin Red Lake mine, profitable from the outset, was merged with Dickenson in 1978. (1978 plans were to deepen the Dickenson No. 2 shaft to some 5,500 feet, with four new levels. 1978 Dickenson output was 1.9 metric tons of gold.)

Noranda gained control of the Kerr Addison gold mine, Kerr Addison Mines Ltd., (Noranda 43.5 per cent), at Virginiatown, East of Kirkland Lake, in NE Ontario in 1949.

As the years went by, costs increased: labour, fuel, everything increased. By the 1950's it was a struggle to make a profit with a gold mine. Most of the several hundred gold mines in Canada operating in 1940 had closed or had begun to feel the pinch by 1949.

Therefore, the Canadian federal government enacted EGMA, the Emergency Gold Mining Assistance Act, under which they made a grant so as to give a better return to the mine. However, some mines did not apply for that assistance because they were better off selling their gold themselves at a profit. The federal aid went on for 24 years and was terminated in 1976.

By that time, no one was applying for aid because the price of gold had been freed in 1968 and by 1972 had established a price well above the fixed price of U.S.$35, (which continued for "monetary" gold). The latter continued as the measure of value of the gold still in the vaults of the Central Banks of the 10 to 15 most prosperous countries in the world. But on the free market, the price after 1971 was much higher and, therefore no mine needed such assistance within Canada.

Although it has been argued that every Canadian taxpayer, even in Prince Edward Island, helped to pay for the E.G.M.A. assistance to gold mines across Canada and thus indirectly for exploration for gold in Northern Ontario etc., the amount of aid given, spread over many years, appears tiny in historical perspective. At the 1980 value of gold, the total average annual E.G.M.A. aid to gold mines works out to the equivalent of only 0.6 of a ton of gold a year.

The cost of Ontario's mining tax deductions introduced in 1949 has effectively been recovered in the higher tax payments now being paid by the gold mines.

Ontario's gold production maintained a fairly uniform level during the 1950's but since 1960 has dropped noticeably. Production from 1950-60 averaged 77.8 metric tons per year. By the 1967-71 period it had fallen to 40.43 metric tons/year and for 1972-76 again fell to 24.9 metric tons a year. In 1975, Ontario produced 47 per cent of Canadian and 2.2 per cent of non-communist world gold output.

It is a very interesting scenario; the boom of the 1930's because of the price, followed by the slow attrition. The official price was fixed and mine production costs were rising and so fewer and fewer people could operate gold mines, (but now there are boom prices for gold again).

SUMMARY OF GOLD MINES—BY AREA

RED LAKE AREA, ONTARIO, NW ONTARIO—OPERATING MINES

1. Campbell Red Lake Mines, 1949—Canada's leading gold producer, 5.8 metric tons in 1980. Has the lowest cost per ounce of gold produced; the 1980 operating cost was $88.15 an ounce. A record high annual average price of $719.20 Canadian per ounce was received in 1980.

2. Dickenson—property adjacent to SE side of Campbell Red Lake; output continuous since 1948; (includes Robin Red Lake, 1968); merged with Silvana mines on October 31, 1980.

   Expansion under way. First stage ready June, 1981, with planned output of 1.5 to 2 metric tons of gold a year.

Wilanour Resources (Camflo 26.4 per cent), owns the old Cochenour Willans gold mine, 1939, which shut down in 1975; not mined out to ore limits. Controls Adjacent Annco, (1965-71), and Wilmar, (1967-71), properties. May be reopened.

PORCUPINE AREA, NE ONTARIO—OPERATING MINES

1. Dome Mines—in continuous production since 1910. Major $50 million expansion under way—ready June, 1984. Production costs were about $170 per ounce of gold.

   Dome now controls other gold producers, Campbell Red Lake Mines Ltd., (Dome 57 per cent) in NW Ontario and Sigma Mines (Quebec) Ltd., (Dome 62.6 per cent). With Dome, these mines produce about 25 per cent of the gold currently mined in Canada.

2. Pamour Porcupine Mines—controlling about 14,000 acres of mineral rights in Ontario—has acquired a number of local gold properties, Aunor, Hallnor, Hollinger, (Ross), McIntyre. Hollinger will be put back into production by late 1982. In early 1980, Pamour was mining 13 to 16 tons to produce each one ounce of gold.

   The Ross Mine is in the Ramore area—50 miles due east of Timmins. Pamour is operating on Canadian Arrow property, also near Ramore. Pamour is getting ore from the Matachewan Consolidated Mine and the nearby Young-Davidson at Matachewan, 50 miles southeast of Timmins. Reserves estimated at the latter are 2 million tons, grading 0.1 ounce of gold per ton. Pamour is also considering an operation on the New Kelore property adjacent to the Ross Mine in the Ramore area. Pamour is also treating ore from the Joburke property in Keith township, Horwood Lake area, 50 miles southwest of Timmins.

KIRKLAND LAKE/LARDER LAKE AREA, NE ONTARIO—PRODUCING MINES

Gold discovered at Larder Lake in 1905; Kirkland Lake in 1911; First milling on Toburn property in 1913.

1. Kerr Addison—gold discovered 1905. Output commenced in 1938. Was at one time Canada's largest producer of gold.

2. Willroy, Macassa Mine. Deep. Currently below 5,000 feet. The 500 ton mill has operated continuously since 1933, currently at 300 tons a day. 2 adjacent properties have been acquired; are mining ore from the Tegren mine property to the south west on the continuation at depth of ore associated with the Kirkland Lake Break.

   New plans now being considered involve a new shaft to cut excessive underground transport distances and doubling of mill capacity.

The Little Long Lac Gold Mines Ltd. group controls:

Willroy Mines
Wright Hargreaves
Lake Shore Mines
Malartic Gold Fields
(includes East Malartic Mines, Quebec.)
Marban Gold Mines

The Macassa, Ontario, Division of Willroy produced 1,243 kg of gold in the first 9 months of 1980. The operating profit for Willroy in 1981 should average $2 million per month.

Lake Shore, Wright Hargreaves and Teck Hughes properties were mined below 8,000 feet.

Lake Shore shut down in 1965. Not mined out to ore limits; nor was Wright-Hargreaves. Lake Shore may be reopened. Has expansion potential.

During the period April through November, 1980, the share price of Lake Shore Mines Ltd. of Toronto on the American Stock Exchange advanced by a remarkable 465 per cent. It has no production currently.

Lake Shore Mines acquired the assets of Barnat Mines Ltd. in Quebec and Norbeau Mines Quebec Ltd. in 1970. Those of McLeod Mosher in NW Ontario were acquired two years before. It also has the Hard Rock Gold Mines property in Ontario, near Geraldton.

Holdings: 75.5 per cent of Malartic Gold Fields Quebec Ltd.
49.6 per cent of Willroy Mines Ltd., (gold producer in Ontario)
37.7 per cent of Wright Hargreaves Mines Ltd., former gold producer, Kirkland Lake, Ontario
27.32 per cent of Long Lac Mineral Explorations

The Cheminis and Barber Larder properties of Amalgamated Larder may be put into production by Kerr Addison. Production is also being considered by Long Lac on the Martin-Bird mine south of Larder Lake and by Sudbury Contact on the La Guerre Mine at Larder Lake.

Gold as a Byproduct in Ontario Mining

An increasing proportion of gold output is a byproduct of base metal mining in Canada. ONE THIRD OF CANADA'S GOLD OUTPUT ARISES AS A BYPRODUCT OF OTHER MINING. The Sudbury, Ontario, nickel mines are not solely dependent upon nickel revenues and, therefore, have the advantage, as compared to most other nickel operations in the world—excluding Russian sulphide ores—of deriving revenue from all the byproducts, gold, silver, platinum group metals, copper, cobalt, selenium, tellurium and sulphuric acid.

Gold is recovered from nickel ores in Ontario, e.g. at Inco's mines. Both Falconbridge and Inco received 26% to 35% of their gross sales from the sale of coproducts and byproducts such as gold mined with the nickel ore. (This proportion changed for Inco after acquiring ESB Ray-o-Vac Corporation, in 1974.) It is one of the major reasons why mining of the Sudbury ores is viable. Higher international metal prices are reflected in the sharply escalated values of the byproduct precious metals mined at Sudbury, Ontario.

Inco's output produces over one metric ton of by-product gold as well as 42 metric tons of silver, in a typical year. Inco is exploring for gold in Canada, Australia and Brazil and for both gold and silver in the Western U.S.A.

5.8.1 WHAT THE ONTARIO PROVINCIAL GOVERNMENT PROVIDES TO ENCOURAGE MINERAL INVESTMENT AND DEVELOPMENT

Present figures indicate that 1980 goes down as a very active year for mineral exploration in Ontario. There has been a great deal of renewed interest in gold mining, and quite a bit of this increased activity is taking place in northern Ontario. It encompasses exploration, reactivation of mines, some new mine development and significant expansions of existing mines, particularly gold mines. Expansion programs went ahead apace also in uranium and at Texasgulf, the large copper-zinc-silver producer in the Timmins area.

How does the Ontario government go about doing its part to bring investment in minerals to Ontario, since capital investment in the Ontario mining industry is essentially externally determined? Well, here is an outline.

The overall mineral policy goals of the Ontario Government are:

1) To promote the orderly development of the mineral resources that are found here;

2) To maintain a healthy and growing mineral sector and

3) To secure for the people of Ontario the maximum economic benefit from the development of the Province's mineral resources.

One major policy goal is to encourage the investment of private capital for exploration and development and another to promote further domestic mineral processing. All of this creates new jobs or protects the current level of employment in Ontario mines, quarries and processing plants. Other goals are to minimize adverse investment effects of policy formulation by all levels and agencies of provincial, federal and municipal governments and to help industry to anticipate changes in market factors which bear on the investment climate.

The Ministry of Natural Resources publishes its in-depth policy analyses and a supporting array of facts on minerals important to Ontario. It provides geological mapping and support services which, wile supportive of the whole industry, make it possible for the individual to compete in the discovery process.

The huge capital requirements for new mines and mineral processing plants pose an enormous challenge.

1) to the mineral industries;

2) to governments

3) to the capital markets and especially

4) to the Junior Mining sector

The mineral industry has always been "long-term" oriented because of the high cost of exploration and the capital-intensive nature of mining and because of the complexity of reducing the ores to saleable metals and other forms. All this means long lead times from exploration to production—which in recent times have been extended by a plethora of regulations. Longer lead times mean higher costs of capital. The exhaustible character and location-bound nature of mineral resources in situ pose additional problems. In the longer term, the mineral supply position will be controlled by the rates of exploration and discovery many years before new mines can come into operation. These rates in turn depend on the after-tax return of capital expected at those early stages. Long lead times from feasibility study to startup of production compound the problem.

The establishment of stable, consistent and balanced government policies is as crucial to success in mineral growth as to technological progress itself. The long-term stability of mineral policies, both provincial and federal, is an essential requirement for a healthy and vigorous mineral industry and for the planning and financing of exploration and development. Both are essential for long-term mineral resource development.

Mineral policies do not and cannot exist in a vacuum. Practical coordination is needed between various policy-making units in government to avoid the creation of conflicting objectives.

It is obviously desirable that there be consultation between Ministries on policy formulation on anything which affects mineral development and on mineral program evolvement so that the actions of government and industry on minerals are mutually reinforcing.

Policies must be initiated or revised on a continuous basis for small as well as large problems. Valid objectives must be set so that all parties with a role to play can move in the same direction. Furthermore, policies must be accompanied by the creation of adequate mechanisms with which to apply them and then to audit the results.

Specifically, *the Government of Ontario provides:*

1) A reasonably free enterprise environment for mineral investment. The Ontario Government does not own or operate any mines and is not in the business of running mines or mineral processing plants.

   This position helps to ensure further growth in mining and smelting ore and refining metals in this Province, because it encourages entrepreneurial exploration here and thus expands our resource base.

2) To individuals and non-mining companies, direct grants or tax credits for mineral exploration—under O.M.E.P., (Ontario Mineral Exploration Program).

The Ontario Mineral Exploration Act, 1980, and regulations made thereunder came into effect on September 1, 1980.

This Act provides incentives for the exploration of mineral resources in Ontario by providing grants equal to 25% of the amounts spent on eligible exploration in Ontario to individuals, residents in Canada and not engaged in nor associated with mineral production in Ontario, who undertake or invest in mineral exploration activities and by providing income tax credits equal to 25% of the amounts spent by eligible companies on mineral exploration. Unused tax credits in any year will be refundable to exploration companies and may be carried forward by companies not principally engaged in mineral exploration.

The budget allocation for 1980-81 was $4,000,000 in grants or tax credits based on eligible expenses of $16,000,000.

The maximum grant or tax credit for any one designated program was set at $250,000 initially and has now been increased to $500,000.

One hundred and thirty-eight OMEP applications were submitted for an estimated expenditure of $42 million since its inception, effective September 1, 1980 to the end of March, 1981. Of these, 94 programs were designated with total expenditures in excess of $33.4 million. Eighty-nine per cent of these expenditures are for exploration for precious metals. Approximately 25% of the expenditures are for advanced programs leading to potential production. Over 50% of the expenditures are in the Northern Region (Kirkland Lake-Timmins area) with 20% each in the Northwestern and Northeastern Regions.

The Mineral Resources Group of the Ministry of Natural Resources processed and audited 42 completed programs for a total eligible expenditure of $6 million and issued about $1.5 million in grants and tax credits by the end of March 1981.

In short, the new OMEP Act is a vital activity that could result in new mine development, creation of jobs and regional economic development, particularly in Northern Ontario.

3) Funding for research into certain difficult metallurgical problems, e.g. the extraction of cobalt from complex silver ores in the Cobalt area in Northeast Ontario.

4) *CUSTOM GOLD MILLING FACILITIES—CAPITAL GRANTS*

The Premier of Ontario, the Honourable William G. Davis, announced in January, 1981, a new program called BILD, (Board of Industrial Leadership and Development), which includes the following:

Custom Gold Sampling and Milling Facilities

Development of small gold deposits and mining of lower grade ore are activities that are currently constrained due to the lack of proper sampling, test milling and milling facilities. The key problem now in the expansion of small gold mine activity is the availability of milling capacity. This situation constitutes at present a true bottleneck. To overcome these constraints,

1) Ontario proposes to provide capital assistance to private entrepreneurs to establish *test custom gold milling facilities* for bulk sampling purposes and the milling of small lots.

2) Ontario also will provide, where necessary, a reference *assaying* service to assure the validity of grade determination and test milling results.

Such facilities may be considered for Red Lake, Dryden-Sioux Lookout, Geraldton-Beardmore, Kirkland Lake and Timmins areas. Studies on the ore potential of other areas may demonstrate the need for other such gold milling facilities.

The prospects for finding small tonnage high grade gold deposits, as well as the reworking of old waste dumps, tailings dumps or old mines in several northern Ontario areas, are high. As an example, northwestern Ontario has had about 70 producing gold mines since the area was settled. The increase in the value of gold has created an opportunity to reopen old mines and develop new discoveries. However, shallow high grade deposits are of interest only if the metal content can be determined. Milling capacity within 200 miles is required to do this. Because the capital costs of concentrators has escalated in recent years, the development of small deposits is only feasible initially if the capital cost of a mineral processing plant is avoided and custom milling is utilized to prove the quality and quantity of ore required to support on-site facilities.

5) In the Mineral Resources Branch, original research along several lines allows quantified assessments of the impact upon industry of changes in commodity market and governmental policy factors.

6) Published accounts of findings on mineral matters, e.g.

—books on individual commodities mined in Ontario, for example Gold, Platinum, Nickel and Zinc, in their world setting, with the mineral policy implications for Ontario;

—authoritative papers on mineral economics on the impact of environmental equipment costs on mining operations etc.

7) *Geological Mapping and Services*

The Ontario Geological Survey (O.G.S.) is headed by the Director of the Survey, who reports to Mr. G. A. Jewett, the Executive Coordinator of the Mineral Re-

sources Group of the Ministry of Natural Resources, as does the Director of the Mineral Resources Branch.

The Ontario Geological Survey, (O.G.S.), with the assistance of the Regional and Resident Geologists in the Regions of the Ministry, has contributed to the discovery of many gold occurrences and mines in Ontario by conducting prospecting courses and by publishing geological maps and reports.

Reconnaissance and detailed geological, geophysical, and geochemical surveys directed toward unravelling Ontario's complex geological history and assessing our mineral resource potential.

Mineral deposit data files containing concise up-to-date information on the location, geology and mineralogy, history of development, ownership, economic features and production (if any) from Ontario's known mineral deposits.

8) In addition to the regular on-going survey projects of the Ontario Geological Survey, several special field surveys and programs for northern Ontario are underway. Funded by other agencies of government, but carried out by the Ontario Geological Survey and the Resident Geologists, these special programs involves expenditures of several millions of dollars a year.

9) The Kirkland Lake Incentives Program, which entered its third year of a five-year program in 1981, is managed by the Ontario Geological Survey of the Ontario Ministry of Natural Resources and funded equally by D.R.E.E., Ottawa and the Ontario Ministry of Northern Affairs. The staking rush which resulted after the release of the geophysical results in 1979 was followed by a steep rise in exploration activity in 1980.

The program has aroused most encouraging interest in the mining communities.

10) Another special five-year program, which moved into its third year in the summer of 1980 is the Northern Ontario Geological Survey program. It is funded by the Ministry of Northern Affairs, but coordinated and supervised by the Ontario Geological Survey.

In this program, a variety of commodity studies and community-based projects are designed to stimulate mineral exploration and to provide data for land-use planning. Special attention is being given to the Atikokan, Cobalt-Gowganda, Sudbury, and Manitoulin Island areas.

11) Production of reports and studies on mineral matters, e.g.

—geoscience maps showing geological, geophysical, and geochemical distributions.

—authoritive geological survey reports, papers, and studies for land use planning and stimulating exploration.

—mapping for the Northern Ontario Engineering Geology Terrain Studies covering some 400,000 square kilometres.

12) The Ontario Government's Geoscience Research Grant Program entered its third year in 1980. Its mandate is to encourage mission-oriented geoscience research in Ontario universities to supplement and complement our own.

Five final research reports were submitted in 1979, seven further final reports were submitted in 1980, and seventeen final research reports are due to be submitted in 1981.

Each year, a summary of research carried out under this program is published for the annual Geoscience Research Seminar. The 1980 seminar held in December attracted great interest as shown by a registration of 530 persons, representing 106 companies, 20 universities, and 15 government agencies.

13) *Other Support*

Continuous work is being carried out on improving road access to Northern Ontario mineral resource areas. In further cooperation with the Ministries of Northern Affairs, Transportation and Communications and Treasury, we hope to contribute to the resolution of some infrastructure and other access problems.

These initiatives hopefully should give Ontario an even larger share of Canada's gold output, eventually, in spite of expansions and openings in other Provinces. These contributions—on a continuous basis—lead to new mineral discoveries and mine developments.

Investment Climate

The mineral industry worldwide thrives best in a climate of cooperation among different disciplines, governments, countries, investment sources and industry sectors and with the assistance of the fields of academic research and the information networks.

There will, in fact, be fierce competition between mineral-rich jurisdictions for capital sums for mineral projects. A great deal will depend *not* on the real situation in Ontario, but on the investor's *perception* of Ontario (or anywhere else) as a place in which to risk these huge sums; *only then* can new jobs begin to be created.

Ontario must continue to impact on this investor world with imaginative proposals supporting and reinforcing the long established image of a *safe haven* for investment in minerals. Unlike factories, mines *cannot* be moved to another location, but exploration dollars can and it is much easier.

EXPANSIONS AND REOPENINGS OF GOLD MINES IN ONTARIO

Uncertainty about the long-term outlook, (until quite recently), discouraged mine managements in Canada and

other countries from embarking on the huge capital spending programs necessary to find and start new gold mines in spite of the eight-fold increase in the free gold price by 1979.

Rising production costs reduced profitability in the formerly very prosperous Canadian gold mining industry but much higher gold prices have brought a boom. Federal government subsidies have been withdrawn since they are no longer needed.

There is so much gold news on expansions and reopenings in Ontario that it is difficult to know how to present the picture. It does appear that there could be a worse way than going across the Province, region by region, starting in the West.

The sections on reported new gold mines and prospects and on announced exploration activities follow.

Red Lake

Campbell Red Lake, at Balmertown, NW Ontario, Canada's richest gold mine, about 6 tons per annum, has a 30 per cent expansion under way, which will increase gold output by 15 per cent by 1982, when full capacity of 7 metric tons of gold a year is reached. About 6.5 metric tons of gold will be produced in 1981.

The $10 million expansion of the Dickenson Mines Ltd. gold mine at Red Lake, NW Ontario, should be completed by July, 1981. Planned output is up to 2 metric tons of gold a year in 1982.

Mount Jamie Mines plans to begin milling at its gold property in Todd Township, at the west end of Red Lake. The mill operated briefly in November and December, 1976, producing a few hundred ounces.

Dome Township, Red Lake

The profitable Quebec gold mining company, Camflo Mines Ltd., has partially developed a major gold deposit in the Dome Township, Red Lake area of NW Ontario through its associated companies Wilanour Resources Ltd., formerly Cochenour Willans Gold Mines Ltd., which closed its mine there in December, 1975, (to be reopened), and Neomar Resources. Controls adjacent Annco and Wilmar properties, which were mined from the Cochenour mine.

Announced $4.5 million program September 3, 1980. Camflo expended $1 million on the Dome Township property by January, 1981 and is to spend a further million by January, 1982. It also expended $1 million on the adjacent Wilmar property it controls and is to spend $2.5 million more on it by January, 1982, by agreement with Neomar. Camflo should eventually own 50 per cent of each of these companies.

Geraldton-Beardmore

Consolidated Louanna has pumped out its shaft at O'Sullivan Lake 25 miles northwest of Nakina, north of Geraldton, and announced a production decision for its property. A 140 ton per day mill will be installed in 1981. The Northern Empire mine in the Beardmore area has been dewatered and underground sampling took place in 1980; may bring in a 200 ton a day mill in 1981.

Wawa

There are efforts to revive the old "Renabie" mine 500 miles northeast of Wawa, Ontario—dewatering underway. Start up—fall of 1981.

Sudbury

Northgate Explorations plan:

> a small scale open pit operation at its Scadding Township claims some 40 km. NE of Sudbury as a first step towards development of the property covering over 8,000 acres; 0.22 ounce gold per ton in three zones; reserves 250,000 tons. Initial extraction of a tenth of that in one of the zones grading 0.27 ounce gold will take place in 1981, to yield about 0.21 metric ton of gold. A similar operation in the other zones is being studied. The company has a $1.1 million budget for these claims.

Timmins-Porcupine

In the Timmins Porcupine area, Hollinger gold mine (Pamour) is to reopen late 1982. Headframe erected on main shaft; rehabilitating 1500 and 1650 foot levels. $15 million expenditure over next 1½-2 years. 250 new jobs. 300,000 tons/year ore production, average grade 0.12 ounce/ton Au.

Dome leads Canada's largest gold producing group. Dome Mines Ltd. is Canada's bellwether gold stock. It is expanding its Timmins, Ontario mine output capacity by 50 per cent. Dome Mines will spend $91 million over the four years through end-1984 to increase ore production to 3,000 tons a day from 2,000. A new shaft, 5,600 feet, is being sunk and processing equipment improved. About 150 new jobs will be created.

When the Dome mine began production in 1910, ore grade was around 0.6 troy ounce per ton. This has reduced gradually to 0.13 ounce per ton, (1979). Dome produced 4.63 metric tons of gold in 1973; 2.91 in 1977; 3.0 in 1979 and an estimated 2.65 in 1980.

Late in 1980, it was announced that Broulan Reef Mines Ltd. and Hugh-Pam intend to reactivate their gold properties at Timmins, Ontario under a letter of interest with Pamour Porcupine Mines Ltd. Broulan holds 47.5 per cent of Hugh-Pam. Broulan adjoins the No. 1 and No. 2 mines of Pamour.

Pamour is to spend at least $1 million during 10 years, at a rate of at least $100,000 a year, on exploration and development of the Broulan property. Similarly, Pamour will spend $350,000 on the Hugh-Pam property over 10 years. Broulan and Hugh-Pam will each receive a royalty on all gold produced from their respective properties.

Holmer Gold Mines is conducting a feasibility study and may put its Timmins gold property in Britsol Township into profitable production by late 1981, at a cost of around $2.5 million.

Larder Resources has dewatered to the 500-foot level the old shaft on its optioned property in Beatty Township near Matheson, east of Timmins. A series of samples have been sent for assay. Bridgeview Resources plan to open the old Jerome Gold Mine in the Opeepeesway Area, 75 miles southwest of Timmins. Diepdaume Mines are planning to put the old Preston East Dome Mine at Porcupine back into production. Associated Porcupine Mines may reopen the old Paymaster Mine in Tisdale and Deloro Townships. Known reserves are about 800,000 tons at 0.23 troy ounce per ton.

Quebec Sturgeon River Mines is planning production of 500 tons per day from their Stock Township gold deposit east of Timmins on which development was halted in 1975. Shaft sinking has begun.

Vedron Ltd. has done considerable work on its option on the Fuller gold prospect, Tisdale Township, Timmins, since it received $360,000 from an underwriting in May, 1980. Announced intent to open pit 35,000 tons at 0.18 ounce gold.

Kirkland Lake

Yorkshire Resources may re-activate the Bidgood Mine, former gold producer, east of Kirkland Lake.

The Lake Shore Mine, Kirkland Lake, controlled by Little Long Lac Mines, may reopen, as well as the Wright-Hargreaves, which is controlled by Lake Shore Mines. Development is proceeding on the tailing deposits of Lake Shore Mines/Wright-Hargreaves Mines. The upper levels of Lake Shore will be reevaluated.

5.8.2 SOME DETAILS OF MAJOR NEW PROJECTS AND EXPANSION PROGRAMS—ONTARIO

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation	Remarks
Dome Mines	South Porcupine, Ontario	2,700 t.p.d.	mid 1980's	$C50m		Mill modernization and mine expansion from 1,800 tonne/day by 1984/5
Campbell Red Lake	Balmer Township, Ontario	970 t.p.d.	1982	$C10.4m	Underground	Expansion of Red Lake from 750 tonnes; $5.2m spent by end 1980.
Renabie Mines	Missanabie, Ontario	450 t.p.d.	1980/81	$C2.5m	Underground	Rehabilitating former mine.
Quebec Sturgeon River Mines	Porcupine, Ontario	Au; 500 t.p.d.	1980's	$C1m	Underground	Development resumed in 1980.
Texasgulf/Inco	Owl Creek, Ontario	Au			Open Pit	Overburden removal underway, exploration continuing.
Detour Lake "Joint Venture"	NE Ontario	Au		$142m		First gold output in 1983.
Opapimiskan Lake	North Caribou Lake	Au		$1.48m spent through end 1980		Could be the most significant find of all. Estimated 1 million tons grading 0.20 ounce per ton

5.9 NEW GOLD RUSH IN ONTARIO

NEW GOLD MINES AND MAJOR PROSPECTS IN ONTARIO

Ontario is a great place to look for gold and many are at it right now. Some have found it. It is quite exciting to look at pieces of the newly discovered gold ore.

There is probably an incredible amount of unmined gold in Ontario, but it is difficult to find it, even at a depth of six or seven metres. At its maximum dimensions, Ontario is about 1,000 miles West to East and about 1,000 miles South to North. Ontario covers 412,000 square miles—as compared to Texas, 267,339 square miles, California, 158,693 square miles and France, 213,000 square miles.

Canadian and Ontario mines are capable of producing much more gold when the price is right, i.e. higher.

There are a number of promising gold developments. Major, as well as several smaller companies are involved in projects to revive old gold mines or to develop new ones. In northwestern and northcentral Ontario there is an abundance of small prospects. In southeastern Ontario, three gold prospects are under investigation.

One problem for mine makers is to decide how long it takes to capitalize the first phase of development and arrive at a going venture with profitable volume. A gold mine developer facing dewatering costs or new workings, a problem of skilled mine labour, environmental limitations, high risk financing and monetary-political uncertainty like South Africa's may yet find that marginal qualities can still be associated with the dream of a gold mine. Not being inhibited by the same economic model, Russia has explored widely for several years looking for placers, open pit prospects or underground occurrences of gold, even using "free enterprise" teams. The apparent result is that they have been an accumulator of gold and have sold only to relieve the need for foreign exchange usually related to food or feed grains purchases from the West, but no one is really sure about the gold stock.

Opapimiskan Lake

There appears to be a significant gold occurrence at a prospect in the Opapimiskan Lake area, about 130 km North of Pickle Lake, Northwestern Ontario. This is a joint venture of Dome Exploration, (project operator), Canadian Nickel, a unit of Inco, Esso Minerals Canada, a unit of Imperial Oil (Exxon) and Lacana Mining of Toronto. Financing costs are divided as follows:

Dome Exploration	35.0%
Canadian Nickel	23.95%
Esso Minerals	23.95%
Lacana	17.1%.

Other Dome Group participants in Dome Exploration are Dome Petroleum of Calgary, 33 per cent, Campbell Red Lake, 21 per cent and Sigma Mines, Quebec, 6 per cent.

55 holes were drilled in 1981, making a total of 178 holes to date. A major drilling program continues—$1 million in 1981. $1.48 million had been spent through end 1980.

NE ONTARIO

$143.2 million Gold Mine for Ontario

The *Detour Lake* venture is likely to be the largest single gold mining operation ever in Canada. By 1988 Detour Lake should be the largest gold producer in Canada in terms of tonnage hoisted and second in output of gold.

In January, 1981, Campbell Red Lake Mines Limited, as operator, announced plans to proceed immediately with construction at the Detour Lake Joint Venture gold deposit located in Northeastern Ontario about ninety miles north of Cochrane and eight miles from the Ontario-Quebec border. Production from a 2,000 metric tons per day open pit operation is planned to begin in late 1983. Mill capacity will be increased to 4,000 tons per day in 1987, at which time the underground mine will come on stream, initially at a rate of 2,000 tons per day and increasing over time as the open pit is phased out.

Indications are that the deposit may represent the largest single gold reserve in Canada. Ore reserves estimated at 27,733,000 tons grading 0.125 ounce of gold per ton are more than adequate for a 20 year mine life; almost 110 tons of gold; at U.S.$500 an ounce, equals U.S.$1.75 billion of new wealth. The potential for additional tonnage is excellent.

Capital expenditures prior to commencement of production are estimated at $143,220,000. The 1981 work program totals $22,756,000 and includes site preparation and construction of a permanent camp, in addition to definition drilling for the open pit. It is planned that all major buildings will be erected in 1982, with equipment delivery and installation scheduled for the following year.

The construction work force will peak at 450 in 1982 and the operating force will initially total 270, increasing to 490 when open pit mining ceases. No townsite is planned at the minesite at present and it is expected that employees will locate in the surrounding communities of Cochrane, Iroquois Falls and Timmins and will be transported to and from work on a rotational basis. If this deposit lives up to indications, there is initial employment and potential for substantial expansion in the future. This would benefit the Cochrane District considerably and exert significant impact on other parts of the Province.

AGREEMENT IN PRINCIPLE HAS BEEN REACHED WITH THE GOVERNMENT OF ONTARIO REGARDING CONSTRUCTION OF NINETY-FOUR MILES OF ROAD TO PROVIDE ACCESS FROM THE COCHRANE-IROQUOIS FALLS AREA. COMPLETION IS EXPECTED PRIOR TO START-UP IN 1983. It is expected that electric power will be supplied by Ontario Hydro.

Amoco Canada Petroleum Co., the discoverer in 1974 of this gold mine, entered into a joint venture agreement with Dome and Campbell Red Lake mines to undertake investigations and feasibility studies. Campbell Red Lake, (the operator), and Dome each have the right to earn a 25 per cent interest in the joint venture by spending $10 million on further exploration and feasibility studies. Amoco Canada Petroleum Co. is to retain 50 per cent. Cyprus Anvil Mining Corporation of Vancouver is discussing acquisition of the Amoco share of Detour Lake.

8 million dollars were spent on the Detour Lake venture in 1979-1980 by Dome and Campbell Red Lake. Some $20 million has been spent by the companies in exploration and feasibility studies of the gold and copper resources in that part of Ontario.

Timmins Area

At least four companies found gold in 1980 near Timmins, Ontario.

1) Broulan Reef Mines Ltd. uncovered a quartz zone containing gold in the Hoyle Township area of Timmins. The area of interest is about 300 feet west of the gold values it encountered several years ago.

   Broulan Reef said four grab samples taken from quartz veins tested at 5.8 ounces, 0.51 ounce, 3.65 ounces and 1.52 ounces of gold per ton. Results from further tests, not yet completed, will give a better indication of the zone's potential.

   Rosario Resources Canada, (controlled by Amax), and DuPont of Canada Exploration are carrying out an exploration program on the Broulan Reef gold prospects in Hoyle Township. At the second gold discovery at Bell Creek, seven diamond drill holes have been completed.

2) Texasgulf plans to bring in a small open pit gold mine in 1981 and is exploring a second find, a gold mining venture with Inco Ltd. on the "Owl Creek" property, originally discovered by Canadian Nickel (Inco) in 1966. Inco Ltd. has a 40 per cent interest in Owl Creek.

   i) *Owl Creek*

   Stripping of overburden at the Owl Creek property, which is 3.5 km west of the concentrator, has begun for an open pit mine, with production scheduled to begin in 1981.

   ii) *Hoyle Pond*

   Texasgulf Inc. discovered gold on its own land just east of its joint venture with Inco Owl Creek property. The "Hoyle Pond" prospect is 4 km west of the Kidd Creek concentrator on land wholly owned by Texasgulf in Hoyle Township. Gold exploration continues at Hoyle Pond, which would eventually have to be an underground operation. (Texasgulf is an important producer of silver at their large Kidd Creek mine.)

   The prospect consists of three parallel, near vertical, northeast trending zones. Twenty drill holes have been completed. Eighteen intersected various amounts of gold mineralization.

   The middle zone at Hoyle Pond now has a strike length of 1,200 feet. Fourteen holes, which cut the zone above a vertical depth of 650 feet, had an average grade of 0.45 ounces of gold per ton over an average width of 7.3 feet. A single deep intersection indicates that this zone extends to at least 1,150 feet in depth. Assays of over one ounce of gold per ton were reduced arbitrarily to one ounce in calculating the Hoyle Pond average grades.

   The north and south zones appear to be shorter and thicker. Each is known to be at least 300 feet in strike length. Three intersections in the south zone had an average of 0.30 ounces of gold per ton over an average width of 12 feet. Three intersections in the north zone had an average of 0.19 ounces of gold per ton over an average width of 25 feet.

   The total size of the deposit is unknown. None of the three zones has been completely delineated. Drilling continues with three machines.

   (Texasgulf Inc. is 34 per cent owned by Canada Development Corporation, an agency of the Canadian Federal goverment.)

3) Abitibi-Price made a gold discovery in Lucas Township, 25 miles north of Timmins. Eleven holes have been drilled on scattered gold mineralization. Results have been encouraging.

4) Asarco is reported to be evaluating the results of the drill program on their gold discovery in Macklem Township, east of Night Hawk Lake.

GOLD EXPLORATION ACTIVITIES

It is reasonable to assume that large low grade deposits of gold will be discovered, as the search intensifies—particularly when the price in current terms goes to the $800-$1600 range.

Kenora-Lake of the Woods-Atikokan-Dryden-Sioux Lookout

Sherritt Gordon and Denison are very active in gold exploration in the Kenora area. Sherritt Gordon has staked or optioned over 20 of the most significant deposits.

Denison has acquired rights to all mining properties of Kenora Prospectors and Miners Limited in the Shoal Lake Area. Also reported that it has optioned St. Anthony Mine at Sturgeon Lake, NW of Thunder Bay. McFinley Mines has an interesting gold prospect with Sabina Industries, in Bateman township, Red Lake area. Planning to dewater.

Noranda and Sherritt-Gordon are considering the joint development of two small gold deposits in the Kakagi Lake/Rowan Lake area east of Sioux Narrows, Lake of the Woods. Cymbal Exploration Incorporated has completed a drill program on the old Flint Lake gold deposit, Kakagi Lake/Rowan Lake area, just south of Sioux Narrows.

Corporate Oil and Gas are drilling a large group of claims for gold in the Mine Centre Area, east of Atikokan.

At the Pine Portage prospect, 6 miles east of Kenora, a dewatering and underground sampling program has been completed.

Goldwinn Resources carried out surveys on two old gold prospects and recently optioned the Split Lake Gold and Alkenore-Buffalo Mines properties near Superior Junction, Sioux Lookout.

B. Staines has drilled his Olcott gold property east of Atikokan.

Dejour mines and Lynx-Canada Explorations are drilling Dawson Road Lots gold prospects 35 miles northwest of Thunder Bay.

Nahanni Mines will begin drilling on its Quyta gold prospect in Pickerel Township, northeast of Dryden after freeze-up. They have completed linecutting and geological work on their Ramsey-Wright option near Atikokan.

Consolidated Professor Mines and T.R.V. Minerals, in a joint venture, encountered gold mineralization in 1981, carrying out development work on the old Dupont Mine on Cameron Island, Shoal Lake, west of Kenora, near the Manitoba border. 15 holes were drilled, some showing ore values from 7.2 g. per ton to 20.6 g. per ton.

President Mines has completed a sampling program on its gold-silver property near Kenora.

Porta-Metal-Mills Ltd. of Sudbury, has placed a small portable gold mill on the old Wendigo gold mine property southeast of Kenora and intends to mill old tailings in the spring of 1981.

Band-Ore Gold Mines optioned off their property west of Shebandowan to Mattagami Lake Explorations Ltd., which according to an old report has over half a million tons of more than a quarter ounce of gold per ton.

East Divide Gold Prospect, Haines Township, Shebandowan area. Shipped test lot to custom smelter.

Fern-Elizabeth gold prospect, Modred Lake, Atikokan area, optioned to Camflo Mines Ltd. and the Crothers Group.

Atiko Gold Mines Corporation's old Sapawe mine, Osinawi Lake in the Atikokan area, dewatered in 1980. Attempting to option the property.

It is not expected that there will be any committment to production by Goldlund until the early winter, late in 1981. The Goldlund company was negotiating with Hollinger-Argus to bring into production a gold property 42 km SW of Sioux Lookout, East of Kenora, in NW Ontario. This might require $16 million to $20 million.

Windfall Oil and Mines Ltd. are currently drilling their gold property adjoining the Goldlund property. Planned to start incline for 1981 development.

Red Lake

Lynx-Canada Explorations has optioned six claims near Red Lake on which previous drilling indicated a gold-bearing structure. Redcon Mines has carried out stripping by bulldozer and is presently drilling on its gold property in the area.

Campbell Red Lake is to carry out ground surveys and diamond drill on the adjacent property of Lassie Red Lake.

Consolidated Gold Fields Mining Corporation, optioned a gold occurrence and plans a major exploration program. Consolidated Gold Fields has carried out line-cutting and mapping on their claim group in Dome and Fairlie Townships, Red Lake area.

Sherritt-Gordon has done mapping and trenching on their optioned property in Killala and Fairlie Townships, Red Lake area. Selco has completed mapping and geophysics on optioned ground in Fairlie and Baird Townships, Red Lake area. Minorex Ltd. has completed mapping and geophysics on their groups in Fairlie and Goodall Townships, Red Lake area.

Getty Oil under a major reevaluation program, is drilling on the old Berens River Mine, Favourable Lake area, 115 miles north of Red Lake. Reported that about 0.5 million tons at 0.2 ounce gold per ton and 7 to 13 ounces per ton of silver are present. Extensive diamond drilling is being done. Getty Mines has optioned the Alexander Red Lake Mines property in the Balmer Lake area and plans to drill.

Wilanour Resources, Red Lake area, is undertaking an aggressive exploration program. Among major companies, Shell Canada Resources, Sherritt Gordon Mines, Noranda, New Jersey Zinc and others have been active, the first two companies primarily in gold.

Consolidated Marcus plans a drill program on its Red Lake property in the near future.

Beardmore-Geraldton

Algoma Development mine, Crooked Green Creek, Pifher Township, Beardmore area. 100 tons of high grade ore was taken to Northern Concentrators custom mill in Thunder Bay.

Phoenix Gold Mines Ltd., (Quebec Sturgeon River Mines Ltd. 95 per cent, Coniagas Mines Ltd. 5 per cent), owns the old Sturgeon River gold mine in the Beardmore area; being examined with regard to a possible reopening. A feasibility study was carried out. May dewater and sample in 1981.

The old Magnet mine is being reexamined.

The MacLeod-Mosher property is being re-evaluated by Longlac Mineral.

Gold Fields Mining Corporation optioned a gold occurrence in the Beardmore area and plans a major exploration program.

Wawa

Dunraine Mines is planning exploration on its newly acquired property in McMurray Township, near Wawa, formerly the old Parkhill Mine.

V. Stenlund drilled one hole on his gold occurrence in Pic Township, near Marathon.

Amax Explorations has a drilling program to locate extensions of the old Alden-Goudreau gold mine, Wawa area.

Ego Resources gold-copper-silver-cobalt-prospect, Abotossaway Township, Goudreau, Wawa area. Diamond drilling is planned.

Kingswood Exploration, Bruyere Township, northeast of Wawa. Drilling planned.

Sudbury

Northgate has met with encouragement in its drill program on its Ashigami Lake gold property in Scadding Township, northeast of Sudbury.

Aggressive Mining is planning to drill its gold-platinum-nickel-copper property in Curtin Township, about 40 miles southwest of Sudbury.

Kirkland Lake-Larder Lake

Stairs Exploration and Mining Co. is taking another look at its gold-silver property in Midlothian Township west of Matachewan, SW of Kirkland Lake.

Lenora Explorations is carrying out tests on samples from the tailings pond on its McVittie Township property near Larder Lake.

Marshall Boston Iron Mines has begun a program on its properties in Boston Township, Larder Lake area. These include the McCrea claim group on which previous work had returned high gold values across widths of about 1½ feet.

Consolidated Cane Explorations staked 440 acres on gold values returned from a showing in Benoit Township. Pancontinental Mining (Canada) Ltd. and Barymin Explorations are reported to be in a joint venture on the latter's gold property in Hislop Township, north of Kirkland Lake.

Inco has completed surveys on its Spring Creek gold property in Catherine Township, southwest of Larder Lake. Golden Bounty Mining Co. drilled three holes on its Montrose Township gold property, west of Matachewan.

Falconbridge Copper is drilling south of Larder Lake. Little Long Lac is reported to be building a road to Thunderwood's Martin-Bird Mine property near Larder Lake. Drilling on the property is continuing.

The Canadian Minerals Joint Venture (Lacana Mining Corporation, Conventures and Murphy Oil Co.,) have completed surveys and some preliminary drilling on their properties in the Kirkland Lake area.

Newmont reported to have drilled for gold in Zavitz Township west of Matachewan and in Yarrow Township, southwest of Matachewan. It is also reported that Amax are drilling Mirado Nickel Mines' property, the old Yama Mine, in Catherine and McElroy Townships near Larder Lake and in Mitchell-Hearst Townships.

Inco is drilling at the Queenston Mine, former gold producer, east of Kirkland Lake, near the old Upper Canada mine.

Rosario and also Little Long Lac are drilling for gold in Arnold Township, northeast of Kirkland Lake.

Denison is drilling on the Sheldon Larder property, adjacent on the west to Kerr Addison.

Edomar Resources Inc. are drilling on the Kir-Vit property north of Larder Lake station. Montreal interests are considering gold recovery from mill tailings at Kirkland Lake.

Noranda drilled in Otto Township, just south of Kirkland Lake.

Steep Rock is drilling one of two former gold producers at Swastika held by Gateford mines.

Matheson

Amax are reported to have drilled on the Teddy Bear Valley Mines gold property, east of Matheson in Harker Township, Lightning River area.

Easso Resources is active in the Northern Region. Hollinger-Esso drilled for gold northwest of Matheson. Colussus drilled for gold near Canadian Johns-Manville's former asbestos producer, east of Matheson.

Chavin of Canada has entered into a joint venture with Energy and Resources (CAM) Ltd. to explore an 18-claim group in Bowman Township near Matheson.

Quebec Sturgeon River Mines expects to process 500 tons a day when their mine, 20 km. west of Matheson, begins producing in 1983. Grade expected: 0.14/0.15 ounces gold per ton.

Lynco Resources have completed a drill program on their gold prospect in Beatty Township east of Matheson. Mid-East Developments obtained encouraging gold values in a drill program on its gold property in Munro Township, 10 miles east of Matheson.

Asarco Exploration is calculating the cost of a shaft at its Nighthawk Lake gold property, 35 km. east of Timmins, with a decision expected in June, 1981.

Timmins-Porcupine

Norcen completed a drill program on the east side of the Nickel Offset gold deposit in Tully Township, north of Timmins. Nickel Offset has completed a feasibility study on its gold prospect in Tully Township, near Timmins. Frankfield Explorations and Intex Mining plan to strip their gold zone in Tully Township to carry out channel and bulk sampling.

Augdome Corporation hit some high grade gold intersections in its drill program on its property east of Timmins in Tisdale and Whitney Townships. Northgate Explorations is in a joint venture with Consolidated Orofino Mines on a drill program at the latter's Horwood Township gold deposit, 80 miles southwest of Timmins.

Sun Mist Mines had drilled on the M & M Porcupine Gold Mines property in Shaw Township southeast of Timmins. Holmer Mines has completed a stripping and sampling program in Bristol Township southwest of Timmins.

Feasibility studies have begun on Holmer Gold Mine's Bristol Township gold property, about 14 miles southwest of Timmins. Carlson Mines plans to carry out work on its recently acquired gold property in the Horwood Lake area about 80 miles southwest of Timmins. Jadex Exploration, a private American company, has received approval from FIRA to proceed with development of its gold-silver discovery in the Horwood Lake area.

J. V. Bonhomme is reexamining the DeSantis mine and is reported to have diamond drilled in Ogden Township, south of Timmins, near the old DeSantis Mine, which he owns.

Northgate Explorations plans to spend $0.73 million in 1981 to continue exploration at the joint venture project, (60 per cent Northgate), with Consolidated Orofino Resources, (Orofino means fine gold in Spanish). This is just over 100 km. SW of Timmins and only 200 km. from the Scadding operation. Estimates are 0.86 million tons, grading 0.21 ounce of gold. A feasibility study is expected late in 1981. A $7 million development program might be indicated.

Southeastern Ontario

In Southeastern Ontario, too, three gold prospects are being investigated. These are located in Belmont Township in Peterborough County, Kaladar Township in Lennox and Addington County, and Barrie Township in Frontenac County.

Further Information

Much more detail on exploration activity in Ontario is available in the Ontario Geological Survey's Annual Reports of the Regional and Resident Geologists and in other publications of the Survey.

The Future of Ontario Mines

The future expansion and prosperity of Canada's mining industry as a whole may well depend on the exciting revival of gold mining. In the past, many of Canada's mining engineers cut their teeth on gold.

ONTARIO MINING ESTABLISHMENTS PRODUCING SIGNIFICANT AMOUNTS OF GOLD

	1980	1979	1978
1st	Campbell Red Lake Mines Ltd.	Campbell Red Lake Mines Ltd.	Campbell Red Lake Mines Ltd.
2	Pamour Porcupine Mines Ltd.	Pamour Porcupine Mines Ltd.	Pamour Porcupine Mines Ltd.
3	Dome Mines Ltd.	Dome Mines Ltd.	Dome Mines Ltd.
4	Kerr Addison Mines Ltd.	Kerr Addison Mines Ltd.	Kerr Addison Mines Ltd.
5	Willroy Mines Ltd. (Macassa)	Wilroy Mines Ltd. (Macassa)	Dickenson Mines Ltd.
6	Inco Metals Co.	Dickenson Mines Ltd.	Willroy Mines Ltd. (Macassa)
7	Dickenson Mines Ltd.	Inco Metals Co.	Inco Metals Co.
8	Mattabi Mines Ltd.	Mattabi Mines Ltd.	Falconbridge Copper Ltd.
9	Falconbridge Nickel Mines Ltd.	Falconbridge Nickel Mines Ltd.	Falconbridge Nickel Mines Ltd.
10	Falconbridge Copper Ltd.	Falconbridge Copper Ltd.	Mattabi Mines Ltd.
11	Noranda Mines Ltd. (Geco Div.)	Noranda Mines Ltd. (Geco Div.)	Union Miniere Explorations & Mining
12	Union Miniere Explorations & Mining	Union Miniere Explorations & Mining	Noranda Mines Ltd. (Geco Div.)
13	Selco Mining Corp. Ltd.	Selco Mining Corp. Ltd.	Selco Mining Corp. Ltd.

Listed in descending order of value of gold production
(i.e. Campbell Red Lake is the largest producer)

ONTARIO

GOLD VOLUME AND VALUE OF PRODUCTION
MNR SERIES

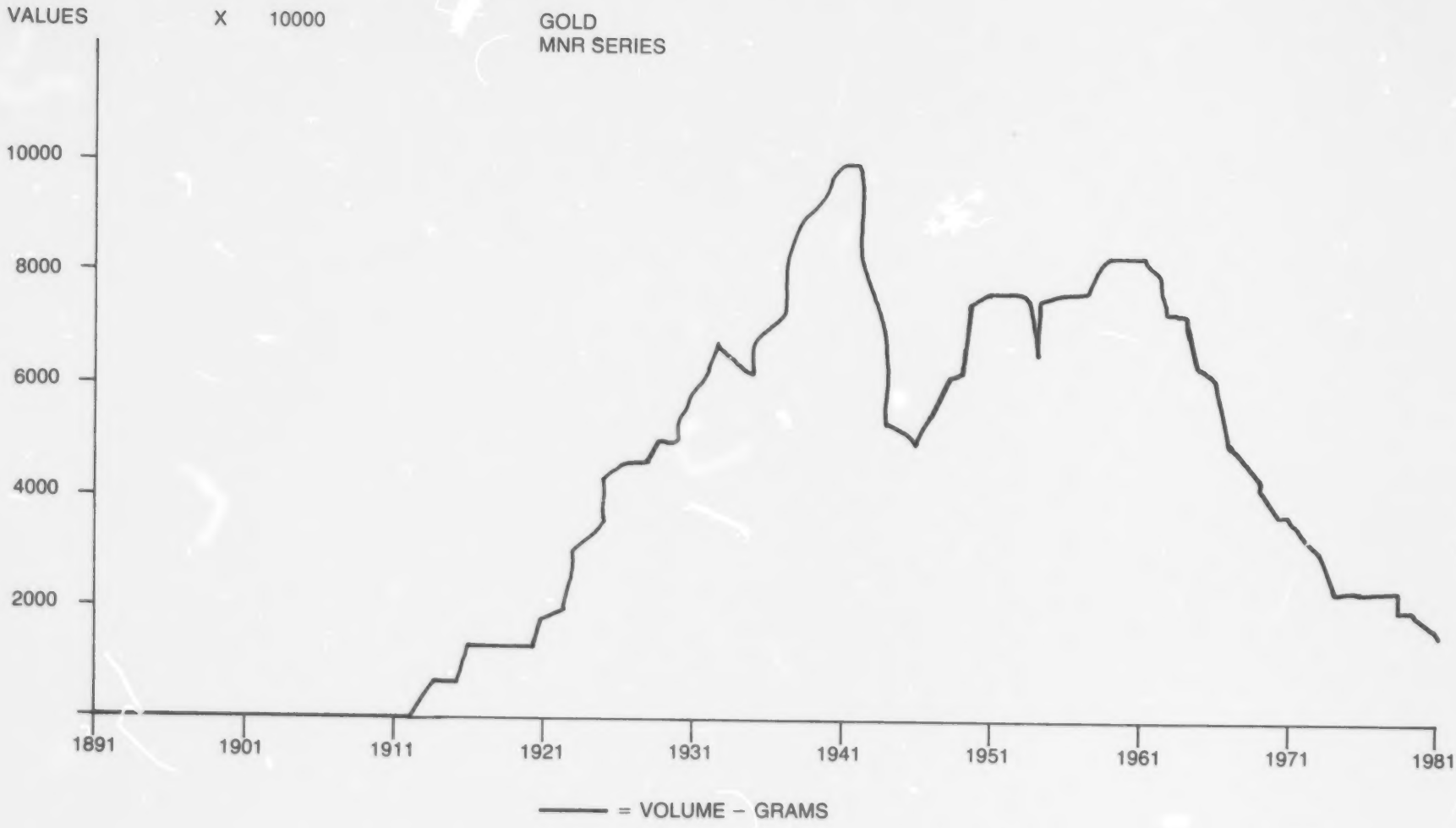
	Volume of Production		Value of Production	
Year	Troy Ounces	Grams	Dollars	1971 Dollars
1940	3261688	101449837	125579597	379394556
1941	3194309	99354116	122977102	344473676
1942	2763822	85964473	106413978	285292164
1943	2117214	65852716	81517998	211186524
1944	1731838	53866183	66675000	167105264
1945	1625367	50554564	62576089	153372768
1946	1801294	56026506	65998448	157139162
1947	1939317	60319501	67876390	148526018
1948	2095424	65174971	73339904	142962776
1949	2354510	73233447	85269362	159084632
1950	2481113	77171241	94216874	171928602
1951	2462978	76607179	91105477	149108800
1952	2513701	78184841	87540620	137426406
1953	2182438	67881410	75388307	118535074
1954	2361387	73447346	80460251	124551472
1955	2523040	78475316	87223660	134190246
1956	2513912	78191403	86489962	128323386
1957	2578206	80191170	86621067	125902713
1958	2716514	84493030	92192231	132080560
1959	2683449	83464594	90083383	126521606
1960	2732673	84995631	92774248	128674407
1961	2637720	82042263	93533551	129011794
1962	2421249	75309262	90578924	123236631
1963	2338854	72746491	88291739	118037083
1964	2155370	67039500	81365217	106082422
1965	1946003	60527459	73420747	92820161
1966	1660750	51655099	62626883	75727791
1967	1495385	46511672	56450784	65716861
1968	1379779	42915924	52031466	58660052
1969	1229666	38246888	46346112	49995806
1970	1162042	36143546	42484255	43888693
1971	1133987	35270938	40079636	40079636
1972	1019303	31703867	58720007	55977128
1973	922303	28686830	89843380	79017924
1974	801105	24917150	124427629	96157365
1975	755148	23487728	123678894	84422454
1976	739500	23001021	91043000	56759975
1977	739000	22985469	115481000	67257425
1978	700800	21797316	154462000	84544061
1979	616422	19172867	221473644	110350595
1980	590288	18360009	387925000	174740990

ONTARIO

GOLD VOLUME AND VALUE OF PRODUCTION
MNR SERIES

	Volume of Production		Value of Production	
Year	Troy Ounces	Grams	Dollars	1971 Dollars
1891	0	0	2000	5555
1892	0	0	6730	18694
1893	0	0	39382	109394
1894	0	0	32777	91047
1895	389	12099	57322	159227
1896	0	0	121929	338691
1897	9065	281953	193243	536786
1898	14177	440953	265003	736119
1899	27620	859078	424708	1179744
1900	18768	583750	297595	826652
1901	14298	444717	244350	678750
1902	8636	268609	229839	638441
1903	5935	184599	185807	516130
1904	647	20123	16130	44805
1905	5429	168860	100612	279477
1906	3442	107058	66389	184413
1907	3821	118846	66560	184888
1908	3475	108084	60084	166900
1909	2051	63793	32745	90958
1910	3619	112563	68498	190272
1911	2185	67961	43264	120177
1912	102278	3181201	2133589	5926636
1913	220625	6862204	4544122	12622561
1914	268203	8342045	5545025	15402847
1915	407128	12663096	8409750	23360416
1916	497525	15474757	10332880	28702444
1917	420855	13090053	8697947	24160964
1918	411876	12810775	8502482	23618005
1919	505962	15737177	10451708	29032522
1920	565703	17595330	13067854	36299594
1921	712570	22163404	16085413	44681703
1922	995850	309974397	20788693	57746369
1923	974221	30301660	20417049	56714025
1924	1241726	38621996	25872600	71868334
1925	1461111	45445632	30152453	83756814
1926	1497312	46571609	30952317	84800869
1927	1627048	50606849	33679706	93295584
1928	1578412	49094101	32631922	90896718
1929	1622253	50457708	33696819	92573678
1930	1736009	53995915	35923157	101477845
1931	2085815	64876098	45016930	135185974
1932	2287391	71145813	53418277	177469360
1933	2155610	67046965	60752124	205243662
1934	2105338	65483331	72808295	242694318
1935	2220426	69062968	78067209	259359500
1936	2389558	74323562	83308201	267872030
1937	2587090	80467494	90508688	282839652
1938	2896477	90090505	101945441	319578184
1939	3086060	95987195	112114762	353674328

ONTARIO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GOLD
MNR SERIES
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1891
1901
1911
1921
1931
1941
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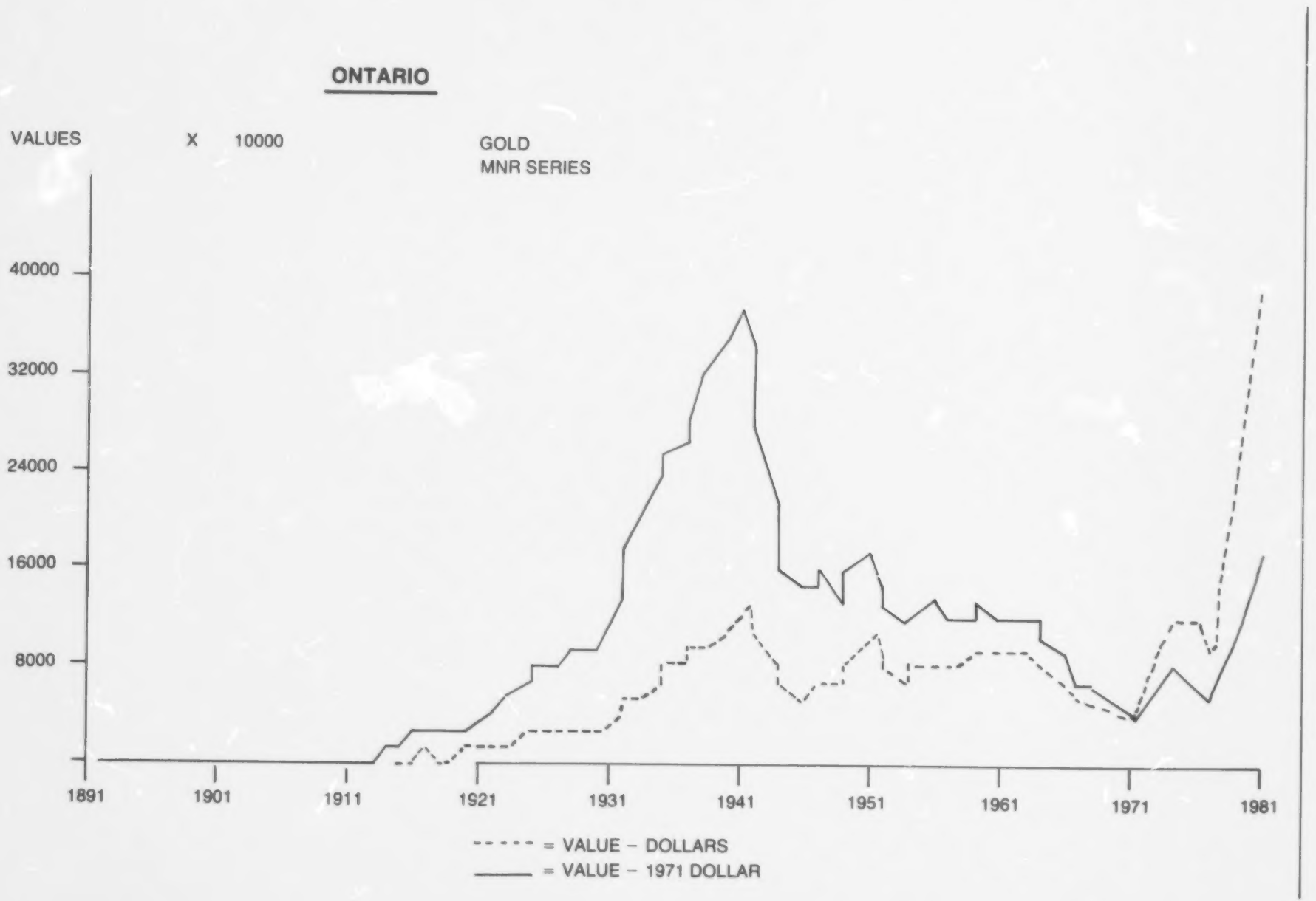
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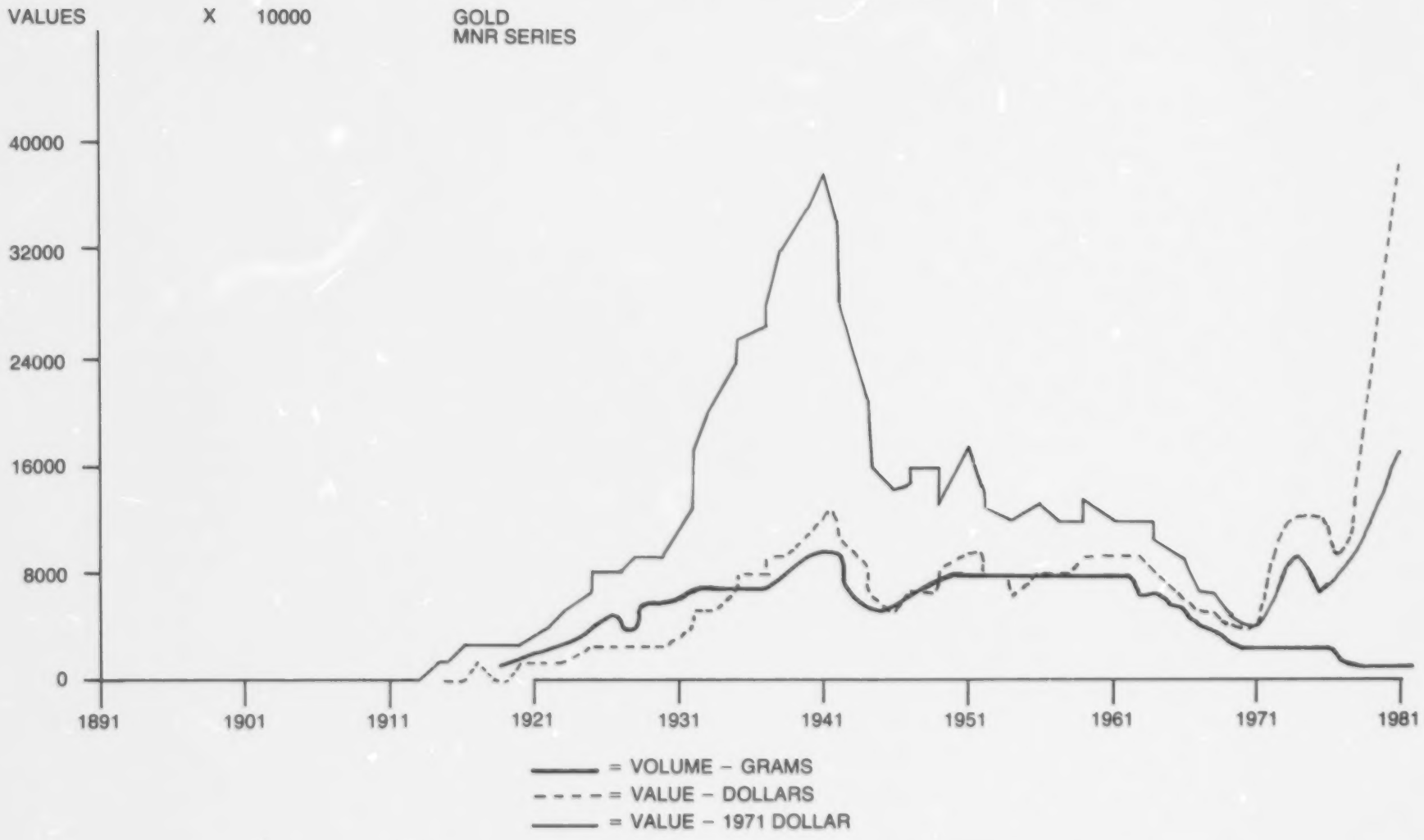
ONTARIO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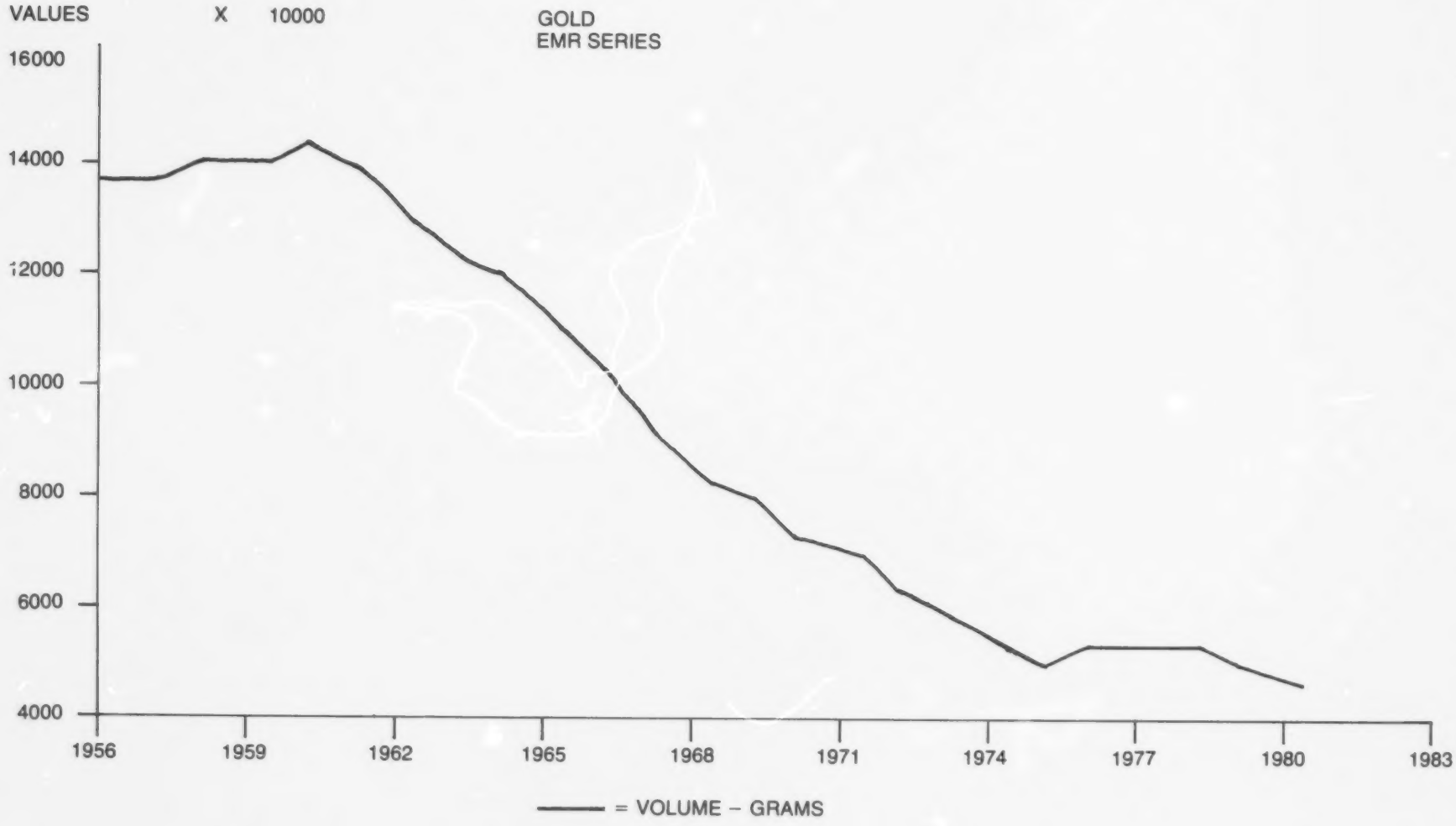
= VOLUME – GRAMS
= VALUE – DOLLARS
= VALUE – 1971 DOLLAR

CANADA

GOLD VOLUME AND VALUE OF PRODUCTION
EMR SERIES

	Volume of Production		Value of Production	
Year	Troy Ounces	Grams	Dollars	1971 Dollars
1956	4383863	136353378	151024080	224071336
1957	4433894	137909516	148757143	216216778
1958	4571347	142184782	155334370	222542076
1959	4483416	139449822	150508275	211388030
1960	4628911	143975222	157151527	217963284
1961	4473699	139147590	158637366	218810160
1962	4178396	129962640	156313794	212671828
1963	4003127	124511165	151118045	202029472
1964	3835454	119295952	144788388	188772346
1965	3606031	112160099	136051943	171999930
1966	3319474	103247180	125177364	151363198
1967	2986268	92883315	112731618	131235876
1968	2743021	85317488	103439321	116617048
1969	2545109	79161737	95925158	103479135
1970	2408574	74915024	88057464	90968455
1971	2260730	70316561	79903241	79903241
1972	2078567	64650659	119742087	114148797
1973	1954340	60786767	190376168	167437262
1974	1698392	52825895	263794245	203859542
1975	1653613	51433112	270830389	184867160
1976	1691808	52621109	208273405	129846263
1977	1733611	53921328	272331217	158608744
1978	1735077	53966926	382423117	209317522
1979	1644265	51142357	590766328	294352928
1980	1552367	48284010	1020151000	459527476

CANADA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GOLD
EMR SERIES
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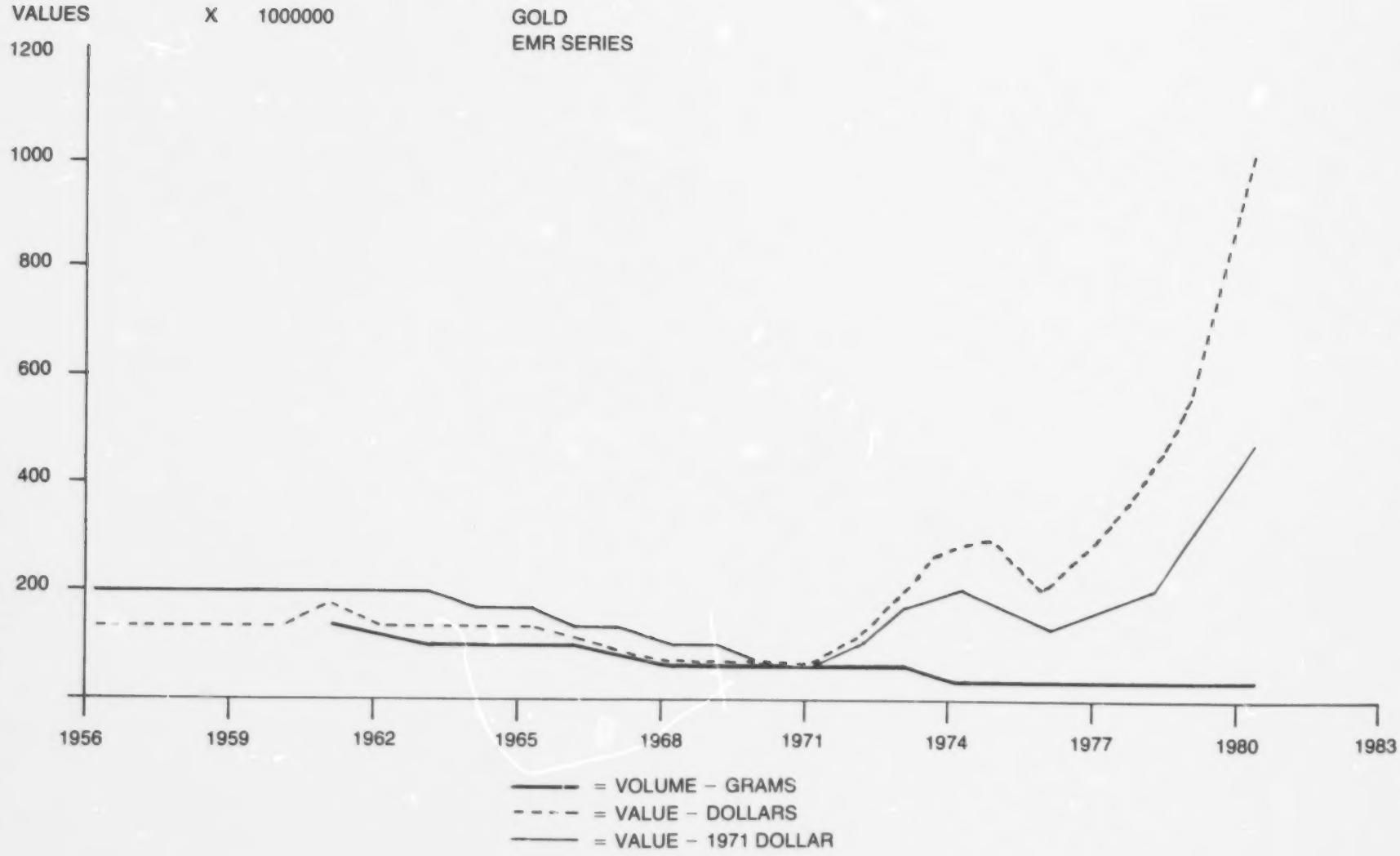
= VOLUME – GRAMS

CANADA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1956
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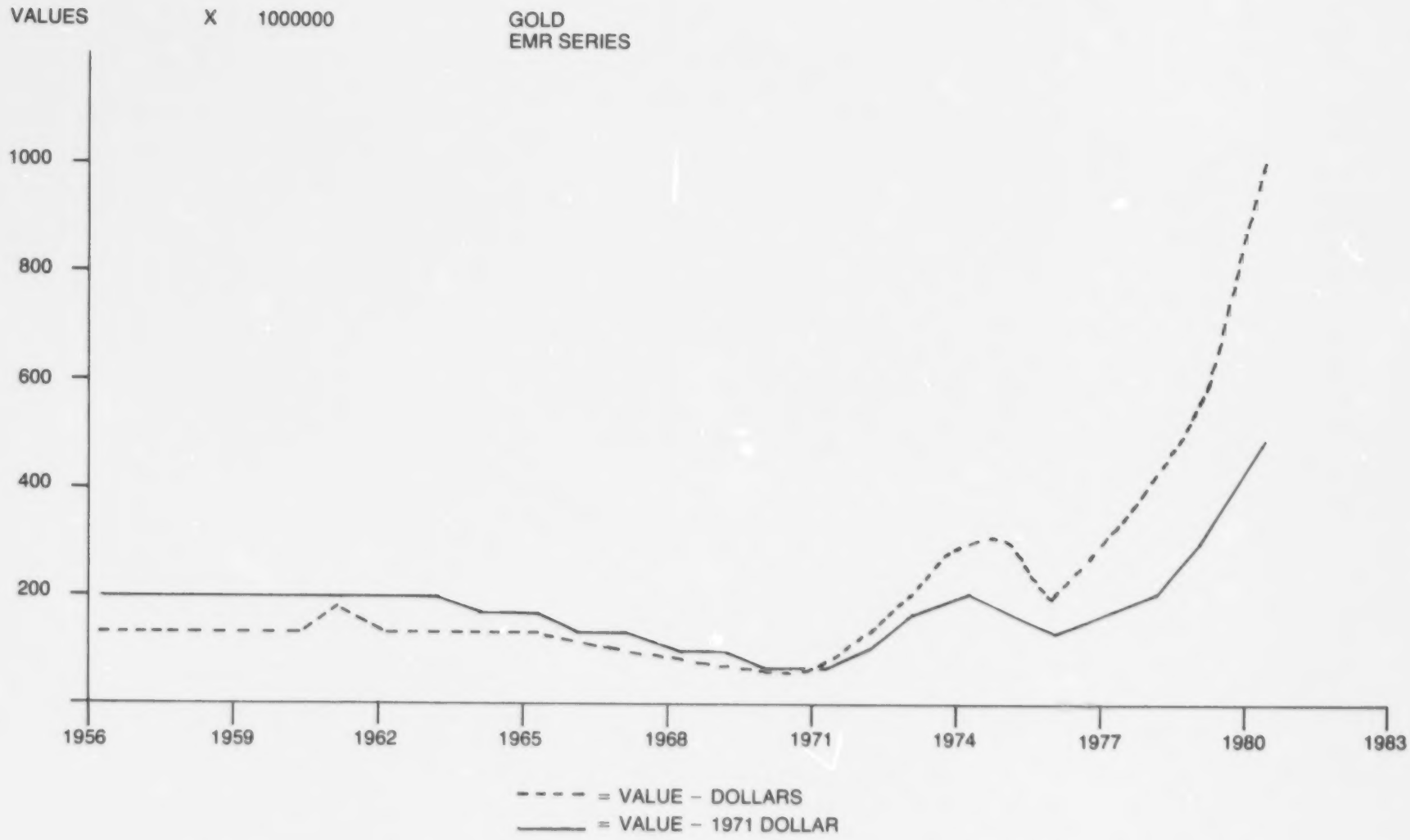
CANADA


VALUES X 1000000
GOLD
EMR SERIES
1000
800
600
400
200
1956
1959
1962
1965
1968
1971
1974
1977
1980
1983
= VALUE – DOLLARS
= VALUE – 1971 DOLLAR

5.10 VALUE

VALUE OF ONTARIO'S MINE OUTPUT OF PRECIOUS METALS (CLOSE TO $1 BILLION IN 1980)

Ontario is Canada's leading gold-producing Province and contributes to making Canada the world's third largest mine producer of gold, after South Africa and the U.S.S.R.

Ontario is the world's third largest mine producer of platinum group metals. Each year, Canada vies with Mexico and the Soviet Union for the position of the world's largest mine producer of silver and Ontario is the leading Province in silver output.

A proportion of the Province's gold and an important part of the silver output arises as a byproduct of base metal mining. Between 6 and 6.5 per cent of the value of the total output of all metals recovered from ores from Ontario's nickel mines consists of the eight precious metals, (gold, silver, platinum, palladium, rhodium, iridium, ruthenium and osmium). IN 1980, OVER 23 PER CENT OF ONTARIO'S METALLIC MINERAL MINE PRODUCTION VALUE WAS PRECIOUS METALS.

The value of Ontario's mineral output from mines, pits and quarries in 1980 jumped by over 40 per cent, ($1.38 billion), to a record $4.66 billion, compared to the $3.276 billion mined in 1979. Of the $4.66 billion, $1.31 billion was nickel.

Gold mined in Ontario in 1980 was valued at a record $388 million and silver at $354 million. 1979 gold output had been $221.5 million and silver $171.8 million. The value of the other precious metals mined, (the platinum group metals), was an estimated $155 million in 1980 and $56 million in 1979—almost a tripling of the value in one year.

Deliveries of precious metals from companies mining in Ontario were valued at:

$900 million in 1980 estimated	$211 million in 1976
$450 million in 1979	$247 million in 1975
$308 million in 1978	$268 million in 1974
$261 million in 1977	

Ontario's total annual mine output value of the eight precious metals has been similar to the Province's total iron ore production value up until 1978. In 1979 it was over 1½ times the iron production value and in 1980 nearly 3½ times. Until 1976, precious metals output values were about ½ the copper production value; equal in 1978 and 1979, while being 1½ times in 1980, even though copper values had been 63% more than the previous decade's average.

5.11 ONTARIO MINE OUTPUT—VALUE OF PRINCIPAL METALS PRODUCED

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980*
					($ millions)					
Nickel	584	519	565	749	816	882	927	474	566	1312
Copper	317	293	353	484	372	391	428	324	457	611
Precious Metals	109	125	170	268	247	211	261	308	450	898
—including *GOLD*	40	58.7	89.8	124.4	123.6	91	115.4	154.5	221.5	387.9
Iron Ore	136	219	145	180	214	252	287	308	287	263
Zinc	122	150	214	335	278	263	231	213	279	252

* Preliminary

5.12.1 YUKON, CANADA

The Klondike, a tributary of the Yukon river, Canada, became world famous in the gold rush at Bonanza Creek. 30,000 prospectors swarmed in. By 1910 the main deposits were worked out. The famous Klondike Gold Rush took place in 1898, although gold had been discovered in 1896. It was a group of placer deposits of gold.

The rush to Canada's Klondike, Yukon gold fields in 1897/98 brought the Alaska panhandle border dispute with the U.S. to near boiling point. Canada feared the loss of the North-West. The boundary was fixed by Arbitration in 1903, favouring the U.S. claim.

Now some of the Yukon gold output is a byproduct of copper mining. The old Venus gold-silver mine near Carcross, Yukon is to be put into production at a cost of $7 million. Output could start as early as June, 1981. $240 million expansion under way at Cyprus Anvil at Faro.

Mine	Location	Mining Method	Size of Operation	Product
Copperfields	Yukon		AV	Au
Kenyon Creek	Yukon		AV	Au
Little Chief	Yukon	U	C	Cu, Au, Ag

LEGEND

A — plus 3 million tonne/year
B — 1 million to 3 million tonne/year
C — 500,000 to 1 million tonne/year
D — 300,000 to 500,000 tonne/year
E — 150,000 to 300,000 tonne/year

U — underground
P — open pit
* — operation suspended

S — solution mines
AV — alluvial/beachsand mines
R — discrete tailings retreatment units

5.12.2 NORTHWEST TERRITORIES OF CANADA

Mine	Location	Mining Method	Size of Operation	Product
Con Rycon	NWT	U	E	Au
Giant Yellowknife	NWT	U	D	Au

Gold is mined at Yellowknife, the capital. Yellowknife has mines producing many millions of dollars worth of gold a year.

Cullaton gold mine will commence production in late summer, 1981. A loan of $25 million has been negotiated with the Inuit Development Corporation.

Camlaren gold mine is now a production under leasing arrangements with Noranda and Pamour.

Echo Bay Mines optioned the gold deposit at Contwoyto Lake, 400 km NE of Yellowknife, discovered by Canadian Nickel (Inco) of Toronto in the early 1960's. Echo has an underground exploration program under way. Echo Bay, a unit of IU International Corporation, Toronto, will have purchased Inco's Lupin gold deposit mineral leases by the end of 1980. (Inco will receive 5 per cent royalty on all gold sold from the project.) IU International of the U.S.A. is the second largest U.S. trucking operation, the world's largest producer of macadamia nuts, produces 400 million pounds of sugar a year and has 143,000 acres of land in Hawaii.

Echo Bay had spent about $10 million on development of its Lupin gold mine. Total cost will be an estimated $108 million in capital. Production is scheduled for mid-1982, at an annual rate of 4 metric tons of gold.

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation	Remarks
IU International Corp.	Contwoyto Lake, NWT	910 tonne/ day Au	1983	$C 108m	P/Cn	New development by Echo Bay Mines subsidiary

5.12.3 BRITISH COLUMBIA, CANADA

In 1858, the gold rush to the placers on the Fraser river, British Columbia began, and later the rich placers of the Cariboo country brought another rush.

High production costs made most of British Columbia's gold mines idle. The Province's only gold mine has been Northair Mines Ltd., Head Office in Vancouver.

Northair—British Columbia's first producing gold field in 40 years. Northair's Brandywine mine began production in mid-1976. A year later it was recovering 3,500 ounces of gold a month.

Cominco Ltd., (Canadian Pacific 54 per cent). High purity Gold Output: 4 metric tons (1972). Gold is a byproduct.

	Location	Mining Method	Size of Operation	Product
Equity Silver	British Columbia	P	B	Ag, Au, Cu
Afton	British Columbia	P	B	Cu, Ag
Granisle	British Columbia	P	A	Cu, Ag, Au, Mo

Afton Mines, (Teck 50 per cent), produced 1.75 metric tons of gold during their 1979-80 fiscal year.
Metallgesellschaft Canada is to acquire the 27 per cent of Afton Mines not already held by Teck Corporation. Afton will then operate as a partnership, 73 per cent Teck and 27 per cent Metallgesellschaft.
Afton had an operating profit of $61 million in 1980.

MAJOR NEW PROJECTS AND EXPANSIONS

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation	Remarks
Bralorne/E&B Exploration	Bralorne, British Columbia	Au				Considering re-opening mine. Plan $Clm initial expenditure with possible further $C5m by 1983.
Carolin Mines	Ladner Creek, Hope, British Columbia	1,350 tonne/day Au	1981	$C20m	U/Cn	Development under-way. $C10m spent in 1980.
*Cons. Cinola/ Energy Re-serves	Queen Charlotte Is., British Columbia	9,100 tonne/day Au 26.8MM st grading		$C180m	Open Pit	U/g bulk sampling, 50 t/d pilot milling in progress
				0.054/0.064 oz. Cost per oz.		Au est. as U.S.$125 per oz.
Dupont Canada	Chappelle, British Columbia	90 tonne/day Au, Ag	1981	$C12m	U/Cn	Baker mine at Chappelle Creek
Equity Silver Mines (70% owned by Placer)	Sam Goosly, British Columbia	4,500 tonne/day Ag, Au, Cu	1980/ 81	$C107m	P/Cn	Mine on stream mid '80, leach plant during '81
Scottie Gold	Stewart, British Columbia	140 tonne/day Au, Ag	1981	$C15m		New mine, financing ar-ranged

* Potentially one of the world's largest gold mines, according to some observers.

Erickson Gold Mining began gold production in 1979 at Erickson Creek, 11 km SE of Cassiar.

Mosquito Creek Gold Mining began gold production near Wells, B.C. in the spring of 1980.

Carolin Mines, with a $20.4 million financing commitment, has gold production plans at its Ladner Creek deposit, 16 km North of Hope, B.C. Output may commence in 1981.

Noranda's Newman property 300 km. NW of Prince George produced 0.68 metric ton of gold in 1978.

Placer Development Ltd., (Noranda 33.3 per cent). Placer has 5.5 per cent of Noranda.

5.12.4 MANITOBA AND SASKATCHEWAN

GOLD OUTPUT

Hudson Bay Mining and Smelting Co. Ltd., (Anglo-American Corporation of South Africa).

	1975	1976	1977	1978
Output (troy ounces)	63,066	65,734	74,393	69,343

Mine	Location	Mining Method	Size of Operation	Product
Anderson Lake	Manitoba	U	E	Cu, Ag, Au
Centennial	Manitoba	U	E	Cu, Zn, Au, Ag
Flin Flon (Main)	Manitoba/ Saskatchewan	U	C	Cu, Zn, Pb, Au, Ag
Osborne Lake	Manitoba	U	E	Cu, Zn, Ag, Au
Stall Lake	Manitoba	U	E	Cu, Zn, Au, Ag
Westarm	Manitoba	U	E	Cu, Zn, Au, Ag

Sherritt Gordon will spend $4.3 million on further development of the Agassiz gold property near Lynn Lake, Manitoba.

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
Brinco/New 44 Mines	Bissett, Manitoba	110,000 tonne/Year AU			U/Cn	Decision on reopening San Antonio mine due 1981

5.12.5 QUEBEC

Quebec produces about 15 tons of gold a year, compared to 24 tons in Ontario.

The major gold producing mines in Quebec are Camflo, Sigma Mines, Agnico-Eagle, Lamaque and Est Malartic.

Camflo Mines, Camflo underground mine. Malartic, Quebec. By 1978, at Malartic near Val d'Or, adjacent to the Lamaque mine, Camflo's Quebec ore production costs were second only to those of Campbell Red Lake, Ontario—the lowest in Canada—1979 operating cost: $82.38 per ounce gold. Grade 0.15 ounce of gold per s.t. By November, 1978, Camflo had produced $150 million worth of gold. Output is about 2.2 metric tons of gold a year.

Sigma Mines (Quebec) Ltd., Val d'Or, (Dome Mines, 63 per cent), produces about 2.1 metric tons of gold a year at Val d'Or.

Agnico-Eagle Mines Ltd., Gold Division, underground mine, Joutel, (Mattagami), 75 miles North of Amos, Quebec, produces about 2 metric tons of gold a year.

MAJOR NEW PROJECTS AND EXPANSIONS

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation	Remarks
Kiena Gold Mines (Falconbridge)	Malartic, Quebec	280,000 tonne/day Au	mid 1980's	$C25m	U	New mine Milling will be done at Teck's Lamaque mill from 1981 on.
James Bay DC/ Meston Lake Resources	Chibougamou, Quebec	Au	1982	$C8m		Reactivating Chibex mine
Agnico-Eagle	Joutel, Quebec	1,500 tonne/day Au	1980's	$C46m	Cn	New shaft at Eagle mine
Batchelor Lake Gold Mines	Batchelor Lake, Quebec	450 tonne/day Au	1981	$C9.3m	U/Cn	Mine development and 450 tonne/ day mill
Belmoral Mines	Val d'Or, Quebec	1,350 tonne/day Au			U/Cn	Also developing adjoining Bras d'Or mine
Mines Gallen (Noranda/ Macdonald)	Dufresnoy, Quebec	900-1,350 tonne/day Zn,Cu,Au,Ag	1981/ 82	$C5.8m	P	West Macdonald reopening
Soquem/ Muscocho Explorations	Montauban, Quebec	140,000 tonne/year Au		$C10m	U	Development work underway

Lamaque Division of Teck Corporation, Val d'Or, Quebec, produces about 1.4 metric tons of gold a year at Val d'Or.

Teck Corporation derived its name from Teck-Hughes Gold Mines Ltd., which it acquired in 1959. In February, 1979, Teck merged with Yukon Consolidated Gold Corporation Ltd. Metallgesellschaft A.G. of West Germany has a 20 per cent stake in Teck Corporation. The German firm's priorities have gold high on the list.

The Barnat gold mine of Les Mines Est Malartic, (Little Long Lac group), has been reopened and produced 4,473 ounces of gold in the first 9 months of 1980.

Les Mines d'Or Thompson Bousquet, (Little Long Lac 63 per cent), started up its new gold mine near Cadillac, P.Q. Ore is shipped some 50 km by truck to the Est Malartic mill for tolling. The mill will be expanded soon at a cost of $1.2 million. Mine de Bousquet division, (Long Lac Mineral Exploration), produced 41,076 ounces of gold in the first 9 months of 1980.

Near Cadillac, the Quebec Government's SOQUEM, (Quebec Mining—Exploration Co.) and Long Lac Mineral Exploration spent $2.25 million for preliminary work at the joint-venture Silverstack gold property, near Thompson Bousquet. Long Lac has a majority interest in Silverstack. Silverstack produced 21,706 ounces of gold in the first 9 months of 1980. 1979 operating cost: over $100 per ounce of gold.

Gold Fields, U.S.A. has 51 per cent of the Darius gold mine; output commenced in 1978. The Darius, (formerly O'Brien), gold mine at Cadillac, Quebec is controlled by Consolidated Gold Fields Ltd., of England through Gold Fields Mining Corporation of New York. Consolidated Gold Fields of South Africa is a group of gold mines that includes three large ones which are the lowest cost gold mines in the country, West Driefontein, East Driefontein and Kloof. Their profit situation is therefore wonderful.

Mine	Location	Mining Method	Size of Operation	Product
Agnico-Eagle	Quebec	U	D	Au, Ag
Belmoral	Quebec	U*	E	Au
Bousquet	Quebec	U	E	Au, Ag
Camflo	Quebec	U	D	Au
Chadbourne	Quebec	U	E	Au, Ag
Darius	Quebec	U	E	Au
Doyon	Quebec	P	E	Au
Lamaque	Quebec	U	D	Au
Sigma	Quebec	U	D	Au
Copper Rand	Quebec	U	C	Cu, Au, Ag
Lake Dufault	Quebec	U	D	Cu, Zn, Au
Opemiska	Quebec	U	C	Cu, Au
Lemoine	Quebec	U	E	Zn, Cu, Au, Ag

Belmoral Mines started to produce gold in mid-1979 in the Val d'Or area, (Valley of Gold), Quebec. A cave-in in May, 1980 caused delays in output. Milling is done at Louvem.

Campbell Chibougamau Mines Ltd.

—Main mine
—Cedar Bay mine
—Henderson mine

Gold is a byproduct of copper mining

Campbell Chibougamau developed its Gwillam Lake gold deposit with the first gold being poured in mid-1980.

Falconbridge Copper Ltd.

—Lake Dufault Division, Noranda-Rouyn
—Opemiska Division, Chapais, Chibougamau, Quebec

Gold is a byproduct of base metal mining.

Mines Gaspé Division of Noranda, (Gaspé Copper Mines Ltd.), byproduct of copper mining.

Lemoine Mines Ltd., (Patino), Chibougamau, Quebec; byproduct of copper-zinc mining.

Louvem Mining Co., Inc., Val d'Or, Quebec.

Mattagami Lake Mines Ltd., Division of Noranda, Mattagami, Quebec.

Noranda Mines Ltd., Horne mine, Noranda, Quebec.

The Chadbourne gold deposit was brought in in 1979 by Noranda.

Orchan Mines Ltd., Division of Noranda

Patino Mines (Quebec), Chibougamau, Quebec.
Copper Rand Mines Division

Quebec Sturgeon River Mines Ltd.,
Bachelor Lake Mine, Demaraisville, Quebec.

At the Kewagama property at Cadillac gold output is expected to start in early 1982.

In June, 1981, Falconbridge will start shaft sinking at the Opawica gold property in Gand township.

5.12.6 NEWFOUNDLAND

CONSOLIDATED RAMBLER MINES LTD.

	1975	1976	1977	1978
Output (troy ounces)	10,463	10,828	11,859	15,393

Mine	Location	Mining Method	Size of Operation	Product
Ming	Newfoundland	U	E	Cu, Au, Ag

5.13 SOUTH AFRICA

South Africa is easily the largest producer of newly mined gold in the world with about half of the world's output. South Africa's gold is mined in a 310-mile arc West and South of Johannesburg.

All previous gold discoveries fade to near insignificance when one considers the importance of the find, one Sunday in February, 1886, on a farm in the Rand region of South Africa. Each year this area produces about 1 per cent of all the gold that has ever been mined in man's history. The U.S.A., Australia and Russia had been the most important sources before that.

Imagine a solid mass of rock tilted at about 45 degrees—like a thick 1,000 page dictionary lying at an angle. The gold-bearing "reef" would be thinner than a single page and the amount of gold contained in it would be equivalent to only 2 or 3 commas in the entire book. In the mine, nature has twisted that page into tortuous variations.

These gold mines are the DEEPEST MINES IN THE WORLD. At enormous depths, in the South African mines, the gold-bearing "reefs" or "seams" often measure less than ten inches thick from top to bottom. It is a very difficult task to get it out, hoist the ore (and the waste rock) to the surface and turn it into gold bullion metal.

"Nature herself makes clear that the production of gold is laborious, the guarding of it difficult and the zest for it very great."—Diodorus Siculus, First Century A.D.

A staggering total of 36,000 tons of gold have come out of South Africa's gold mines since 1886—or 31 per cent of all the gold that man has ever produced.

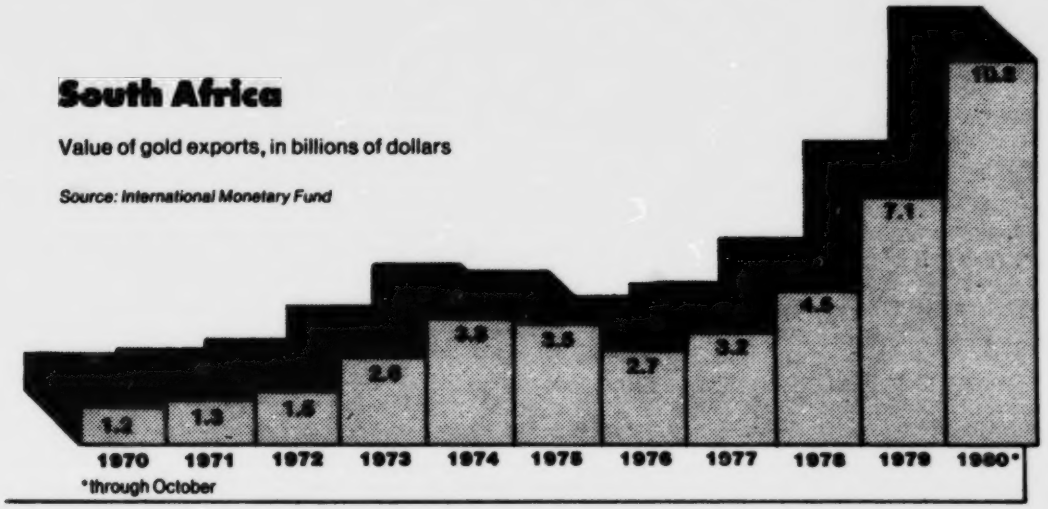
Over 40 per cent of all the gold mined in the world in this century came from South Africa.

Over the next 20 years, South Africa could produce an estimated 12,000 metric tons of gold, if there are no major labour problems, no sabotage and if the U.S.$50 billion required to sustain the industry can be found. A general decline in annual gold output from the present level appears inevitable, but of course it is always possible that a massive new find could be made in the future.

South Africa

Value of gold exports, in billions of dollars

Source: International Monetary Fund



Value

Gold exports alone pay for all of South Africa's imports of all kinds, plus a multi-Billion dollar surplus.

The contribution of gold to the South African economy in 1980 was about Rand 10.3 billion, about three quarters of the total earned in foreign exchange by the mineral industry in the year. Minerals are about 70 per cent of total foreign exchange earnings. South Africa's overall rate of inflation in 1980 was 14 per cent.

South Africa is struggling with the problems of prosperity arising from the high prices obtained for gold, platinum, diamonds etc.—inflation, a shortage of skilled labour and a scarcity of industrial capacity.

1 Rand =	U.S.$1.3405	January 21, 1981
1 Rand =	U.S.$1.3115	February 4, 1981
	(down 3.07 per cent)	

If the gold price continues at U.S.$500 or higher, it appears likely that some South African gold mines will be required, (under the terms of the mineral leases from the government), to move into even lower grade areas, resulting in a further decline in overall gold output. Since the state owns all of the precious metals found in the ground, a mining lease has to be obtained from the government. All of South Africa's gold mines are obliged to mine to the average grade of payable ore.

If gold were to stay at U.S.$450 (or less) for a sustained period, many low-grade mines would have to:

1) abort capital expenditure programs and
2) cut dividends sharply.

EVERY SUSTAINED TEN U.S. DOLLAR RISE IN THE WORLD PRICE OF GOLD BULLION PER OUNCE NETS SOUTH AFRICA 240 MILLION DOLLARS AND MEANS AN ASTONISHING RAND 110 MILLION IN GOLD MINE TAXES FOR THE GOVERNMENT OF SOUTH AFRICA.

Several gold mines in South Africa produce valuable osmiridium as a byproduct, as well as uranium.

Gold output and exports will remain the cornerstone of the South African economy for many years to come. Mining provides 26 per cent of the Gross National Product and gold mining provided 18 per cent.

South Africa, with low labour costs, (which have risen rapidly in recent years), produces about half of the world's newly mined gold, compared to the Soviet Union's 21 per cent. It is refined to standard gold bars weighing 27.5 pounds each. All gold produced must be delivered to the South African government's central bank. From time to time, (ostensibly when its balance of payments is favourable), South Africa tends to withhold part of its new gold production from the free market, accumulating it in the country's Central Bank to build up the gold content of the national monetary reserves. This spasmodic withholding exerts a major upwards force in the free market price of gold which is out of all proportion to the huge static monetary reserves of the major countries.

From March, 1968 the Central Banks of the major powers disappeared from the market. London remained closed for a time and then South Africa discontinued its gold sales—one of the chief reasons for this move being the country's then favourable balance of payments—and for a limited time Zurich was faced with the task of having to regulate the demand and supply of gold on the entire world market.

Sales of Gold

South Africa offers virtually all of its mine production of gold for sale—either as bullion bars or as Krugerrand gold coins. About 80 per cent of the South African gold production has been channelled through the Zurich market. Trading volume figures are never issued, but Zurich probably averaged up to 11 tons or more of physical South African gold weekly.

South Africa is now selling a far greater proportion of its bullion through German banks.

German Bullion sources estimate that the Reserve Bank sold about 25 per cent of its gold through West Germany bullion houses in 1980, compared with about 10 per cent in the 1970's. Sources estimate that the Swiss houses received only about 40 to 50 per cent of South Africa's gold last year.

It is reported that the volume of gold going into the minting of Krugerrand coins, at the peak period, attained a ratio of 27 per cent of South Africa's total production of newly-mined gold.

One cannot buy bullion gold in South Africa. The gold mines do not make direct sales. All crude gold bullion bars produced at the mines in South Africa are refined to minimum 99.5 per cent purity in the Rand Refinery, Germiston—easily the largest gold refinery in the world.

All newly mined gold must be delivered to the Central Bank, the government Reserve Bank and under their system, the South African government withholds whatever quantity of newly mined gold it chooses for the national reserve, (sometimes one-third of weekly production), and makes an initial payment to the mine for this gold in Rand currency. All South African internal gold accounting is done in U.S. dollars.

The South African Chamber of Mines, (which owns the Rand Refinery), representing all mines, acts as a central agent for the South African Reserve Bank.

All gold not withheld by the South African government (and sometimes some gold from the Reserve), is either sent to the government's South African Mint to make Krugerrand coins, or is sold, usually weekly, by a central agency, the South African Reserve Bank, in Zurich at the free market price. It went as high as $820.00 an ounce in 1980. The tim-

ing and amounts of such sales by the Bank are determined solely by national requirements regarding the balance of payments and the State currency reserves.

Every one dollar per ounce rise in the bullion price means an extra Rand 11 million in gold mine taxes for the government. In 1980, the South African government more than doubled its tax take from the gold mines to Rand 3,800 million.

It is not possible to estimate the actual sales of gold by South Africa in 1980 accurately because some of the "gold swap" loans dating from 1976 and 1977 have been redeemed, adding an unrevealed amount of gold to the stock available for sale.

Withholding

Early in December, 1980, South Africa stated that it would withhold substantial amounts of newly mined gold from sale on the free market if the price declines to the U.S.$450 level. The reaction to this cut-off of supplies from the world's major gold producer would push the gold price much higher—in the absence of other major factors such as strong Soviet selling and high interest rates.

South Africa withheld about 6.5 metric tons of gold from the world market in September, 1980, ostensibly because of a comfortable balance of payments situation.

The South African government also held back from the market 4.3 metric tons of gold in October reportedly because the country's comfortable balance of payments did not justify the sale of all of the month's mine production of gold. This action and the low Russian sales were bullish factors for the gold price.

South Africa's official holdings of physical gold stood at Rand 5,644,688,264 at the end of September 1980, valued at about U.S.$469 per troy ounce. South Africa's Reserve Bank holdings of gold rose 66 tons from 312 metric tons at end 1979 to 378 tons at end 1980. (Compare annual mine output of gold of about 680 tons.)

The strong South African Rand has varied in value from U.S.$1.15 to $1.33 since January, 1979.

In May and June, 1979, physical deliveries of gold were very low. Observers deduced that mining companies were withholding gold to test the market, but the mines must deliver their gold output to the Reserve Bank by the end of each month.

A likely explanation is that part of South Africa's gold production is going to the Middle East to pay for oil. (The Soviet Union may also be paying Iran in gold for oil and natural gas.)

Demand for Kruggerrand coins had increased in Europe by mid-1979 and the Reserve Bank may have diverted more gold bars to the South African Mint to meet that demand and delivered less bullion to Zurich.

Goldfinger

The wealthy Charles Engelhard of New Jersey was reputed to be the person on whom the writer Ian Fleming modelled the exotic character Goldfinger in his James Bond series.

Charles' mother was born a Heraeus of the famous German precious metals family.

Engelhard Industries, an important refiner and consumer of gold, held the largest single gold licence from the U.S. Treasury in the years before 1975. The law was changed at the end of 1974 and U.S. citizens were once again permitted to own gold bullion.

Fleming is said to have been fascinated by Charles Engelhard's talk about gold when they met on vacation in Jamaica, after World War II.

In the late 1940's, Charles Engelhard was looking for a way to import gold direct into the U.S.A. without going through the fuss and procedure of international exchange. Under South African Reserve Bank rules there was no way to export gold bullion bars. It was, however, permitted to export South African made objets d'art and jewellery.

Engelhard set up a new company, Precious Metals Development, and manufactured jewellery which he exported to Hong Kong and immediately melted down into gold bars again. This true life incident was the basis of that part of Goldfinger that deals with the ingenious smuggling of gold and the Lavender Hill Mob story also.

SOUTH AFRICA NEWLY MINED GOLD PRODUCTION

1976	1977	1978	1979	1980e	1981e	1982e
			(metric tons)			
713.0	697.0	706.4	703	674	675	675

Average grade mined: 8.85 g per ton
(1978) (4 per cent less than 1977)

South African gold output: December, 1980 was only 52.7 metric tons. 1980 total: 674 metric tons of gold, the lowest since 1960.

Output rose to 55.4 metric tons of gold in March, 1981 from 53.6 tons in the previous, shorter month of February.

GOLD OUTPUT (CUMULATIVE) OF CERTAIN SOUTH AFRICAN GOLD MINES— TO END 1979

		Started Output
West Driefontein	1,466 metric tons	February, 1952
Crown Mines	1,412 metric tons	August, 1897 (closed March, 1977
Western Holdings	1,061 metric tons	July, 1953
Free State Geduld	1,014 metric tons	January, 1956
President Brand	958 metric tons	August, 1954
Vaal Reefs	931 metric tons	May, 1956
Blyvooruitzicht	905 metric tons	February, 1942
Government G.M. Areas	869 metric tons	October, 1914 (closed September, 1962)
Western Deep Levels	835 metric tons	March, 1962
Buffelsfontein	684 metric tons	January, 1957
Harmony	681 metric tons	September, 1954
St. Helena	652 metric tons	November, 1951
Randfontein	652 metric tons	June, 1924 (closed 1967)

5.4 ESTIMATED MINE PRODUCTION OF GOLD IN THE WORLD SINCE 1887, and the PROPORTION PRODUCED BY SOUTH AFRICA (excluding U.S.S.R. from 1953 onwards)

Year	Total World Metric Tons	South Africa Percentage
1887	159.4	0.8
1888	266.7	4.2
1889	186.1	5.9
1890	178.0	7.7
1891	190.0	11.3
1892	220.9	15.1
1893	237.0	15.7
1894	272.7	20.6
1895	299.3	21.0
1896	304.2	20.7
1897	355.1	24.0
1898	431.6	27.6
1899	466.9	24.2
1900	383.9	2.8) S.A.
1901	395.1	2.0) War
1902	449.7	11.9) Period
1903	493.1	18.7
1904	522.7	22.4
1905	571.5	26.7
1906	604.8	29.8
1907	621.4	32.3
1908	666.4	32.9
1909	683.0	32.2
1910	685.0	34.2
1911	696.3	36.7
1912	702.3	40.3
1913	702.3	39.0
1914	672.1	38.9
1915	709.1	39.9
1916	683.7	42.3
1917	631.2	44.9
1918	576.6	45.4
1919	539.4	48.0
1920	500.1	50.7
1921	495.8	51.0
1922	478.9	45.5
1923	552.9	51.5
1924	583.6	51.0
1925	583.4	51.2
1926	595.7	52.0
1927	594.7	52.9
1928	590.3	54.6
1929	600.3	53.9
1930	650.3	51.3
1931	696.9	48.6
1932	755.8	47.6
1933	788.0	43.5
1934	849.0	38.4
1935	921.4	36.4
1936	1031.2	34.2
1937	1088.1	33.5
1938	1163.6	32.5
1939	1188.1	33.6
1940	1251.7	34.9
1941	1226.6	36.5
1942	1086.7	40.4
1943	830.3	48.0
1944	745.2	51.3
1945	716.7	53.1
1946	731.1	50.7
1947	742.3	46.9
1948	776.3	46.4
1949	774.0	45.2
1950	826.9	43.9
1951	804.5	44.5
1952	823.8	44.6
1953	762 (Free World)	48.7
1954	805 "	51.1
1955	846 "	53.7
1956	880 "	56.2
1957	917 "	57.7
1958	951 "	57.7
1959	1020 "	61.2
1960	1066 "	62.3
1961	1104 "	64.6
1962	1169 "	67.8
1963	1213 "	70.3
1964	1247 "	72.6
1965	1281 "	74.1
1966	1284 (peak)"	74.8
1967	1238 "	76.7
1968	1247 "	77.5
1969	1253 "	77.6
1970	1266 "	79.0) peak in
1971	1234 "	79.1) percentage
1972	1173 "	77.6 share
1973	1113 "	76.8
1974	1003 "	75.6
1975	956 "	74.6
1976	969 "	73.6
1977	970 "	72.2
1978	980 "	72.0
1979	962 "	73.1
1980	947 e "	71.5

During the first two months of 1981, South Africa's gold output was running at an annual rate of only 645 metric tons. It is hard to see how 1981 gold output could exceed 660 tons. It is worth mentioning that the first quarter 1981 average gold price was U.S.$519 per ounce, in contrast to the 1980 average receipt of U.S.$613 an ounce. In other words, gold price down, gold output rate down, not the normal pattern.

Vaal Reefs and other mine producers will have to stockpile their uranium output until the mid-1980's when they expect an upturn. The country's uranium is almost entirely a by-product of gold mining, excluding the country of South West Africa (Namibia), and therefore it is about the cheapest uranium to produce in the Western World. All sales of uranium are made through Nufcor, which is the Free World's largest single supplier of nuclear fuels.

Vaal Reefs mine, (Anglo-American Group), is the Western World's largest single producer of gold—69.9 metric tons in 1980—and is also the largest producer of uranium oxide in the Republic—1,060 metric tons of U308 a year. Extensions at Afrikander Lease, a subsidiary of Vaal Reefs, will cost R23 million.

Anglo-American Corporation, the largest corporate producer of gold in South Africa, was formed in 1917 to mine for gold in South Africa. J. P. Morgan and Company, New York, U.S.A. provided one million dollars. The Oppenheimer family controls Anglo-American, which in turn controls Engelhard, U.S.A. Anglo-American managed mines produce about 40 per cent of the country's gold.

Anglo-American will spend U.S.$6.7 *b*illion on development during the 5 year period, 1981-85, an average of $111.6 million per month.

Over the next 12 years Western Deep Levels, (Anglo-American), alone will spend Rand 715 million—the best part of 1 billion dollars—to increase mine production. The new workings will be the deepest in the world, eventually 17,000 feet. Western Deep currently produces about 50 tons of gold a year.

Lonrho will develop a U.S.$530 million gold mine in the Erfdeel/Dankbaarheid area—to commence output in 1986 producing over 10 metric tons of gold a year.

A R300 million programme to rejuvenate one of the oldest gold mines on the Reef, East Rand Proprietary Mines, is well advanced.

The program—to be spread over five years—will turn ERPM into one of South Africa's super mines with a production of almost 4-million tons a year. Rand Mines announced the scheme in August, 1980 and officials said there was sufficient ore in the mine to last support mining operations for at least the next 25 years.

In March, 1980, the Randfontein Estates Gold Mining Company, Witwatersrand, Limited, (J.C.I.), announced plans for the sinking of the Cooke No. 3 shaft to exploit the southern portion of its lease area. Full-scale production at the rate of 150,000 tons milled per month is expected to be achieved in 1986. Good progress has been made in overcoming production difficulties at the Cooke plant.

Gold Fields of South Africa will spend U.S.$13.3 million on exploration during 1981.

West Driefontein, controlled by Consolidated Gold Fields, is the most profitable gold mine the world has ever known. It alone produces more than twice the total U.S. mine output of gold.

Mine expansion programs at General Mining Union Corporation ("Gencor") are currently planned on the basis of the following assumed "average" gold prices, at what the company believes are *conservative* projections.

1981	U.S.$580
1982	U.S.$620
1983	U.S.$670
1984	U.S.$750

n.b. 1) current dollars, unadjusted for inflation;

2) assuming that ore grades decline from 6.1 g. per ton in 1980 to 4.7 g. in 1982, but tonnage milled rises from 11.4 million to 13.5 million over the same period owing to expansion programs;

3) Gencor mines are generally low to medium grade and are therefore very susceptible to gold price fluctuations and production cost increases.

Production cost increases in virtually all of South Africa's mines have been greater than the inflation rate in recent years. The following projections at Gencor are of interest.

	Mine Operating Costs
1981	up 17.5 per cent
1982	up 15.0 per cent
1983	up 15.0 per cent
1984	up 17.0 per cent

In 1974, 1975, 1976 and 1977, South African gold mining costs per ton milled increased by:

25.4 per cent
26.8 per cent
15.5 per cent and
23.7 per cent respectively,
or by over 100.0 per cent in four years.

The increase in working costs at the mine acted to neutralize most of the benefit of the higher level of gold prices over those years. The extremely low gold prices obtained in 1976 did not improve the situation.

The highest mine production cost in the fourth quarter, 1980 was at the Loraine mine—U.S.$539 an ounce. The lowest

cost was at East Driefontein with only $100 an ounce. South African mines that have the ability to vary the grade of ore mined and thus offset the fall in the price of gold bullion and rising mining and milling costs include Kinross, Buffelsfontein, Doornfontein and East Driefontein.

More than one observer says that the new mines being developed in South Africa will not be economic unless the price of gold is over U.S.$500 in constant 1980 dollars.

When gold moves to a position lower than U.S.$500 an ounce, some of the lower grade producers start to move towards red ink. In the December, 1980 quarter, several mines had operating costs well over U.S.$400 an ounce:

	Operating Cost	Gold Output
Loraine	U.S.$539	7.6 metric tons a year
Witwatersrand Nigel	U.S.$461	1.0 metric tons a year
E.R.P.M.	U.S.$433	11.0 metric tons a year
Durban Deep	U.S.$421	9.0 metric tons a year

However, on the whole, most mines produce gold for less than U.S.$300 an ounce.

J.C.I. economists calculate that, with an average gold price of U.S.$550 an ounce, operating costs should rise 20 per cent in 1981, with, of course, a much larger increase for capital equipment.

South Africa no longer produces as much gold from its mines as it did in 1970, but nevertheless produces as much new gold as the rest of the world put together. In 1974, the Anglo-American Corporation Group alone produced one third of the free world's mined gold output. The country has large reserves of "high grade" gold ore and had access, until recently, to a large reservoir of extremely cheap black labour. Wages have risen and there is a critical shortage of labour. The gold mining industry had employed about 410,000 people, with up to 280,000 of them underground. At present, only 350,000 are at work. A typical mine has employed 12,000 people, incidentally. Up to 70 per cent of the workers came from foreign countries. They are voluntary immigrants on short term contracts, most of them trying to escape much worse conditions in their home nations in Africa.

South African mines have become world leaders in the development of automation and the development of mechanical robots for underground work, nevertheless an *additional* 100,000 black workers will be needed to open up new gold and platinum mines by 1982. Mechanization is being rushed.

The known remaining gold in South Africa is in deep narrow veins, or reefs, at great depths. The deepest gold mine is over two miles STRAIGHT DOWN. Mining is taking place as deep as 3,900 metres down. There are many special problems in deep mining such as high humidity and stope temperature, as well as rock stress, dust and the difficulty of mechanization.

The physical volume of mining, the tonnage of ore and rock brought to surface, has increased by over 300 per cent since 1950. In contrast, the progressively lower gold content of the ore has meant a falling gold output each year.

Some 4 tons of rock must be hoisted and processed in South Africa to produce *one ounce* of gold and a tiny amount of silver. An incredible total of about 8 million tons of rock a month are brought to the surface in South Africa's gold mines. These are the deepest mines in the world, and working costs rose by almost 43 per cent over the 3 years, 1973-1975, (about the same rate as Canada), and have since been rising at an average of at least 25 per cent per year.

South African mines produced 55.85 metric tons of gold in September, 1980, continuing the falling trend in gold output. Output in the first three quarters of 1980 was 509 tons of gold, a drop from 530 tons for the same period in 1979.

The decrease in South Africa's mine production is partly caused by the policy applied when the gold price rises—ore grades are considerably reduced and the tonnage hoisted and milled rises.

The average grade of ore mined in South Africa was around 7.28 g. per ton in 1980, or 7.28 parts of gold to 1 million parts of gold-bearing conglomerate rock called "reef".

South African gold production has slowly declined since the peak of 1,000.4 tons in 1970. In spite of higher prices, output fell and could decline much further, but a lot still depends on the gold price level. The Stanford Research Institute (1972) did forecast that gold production in South Africa might have ceased by the year 2000, but this now appears to be unduly pessimistic.

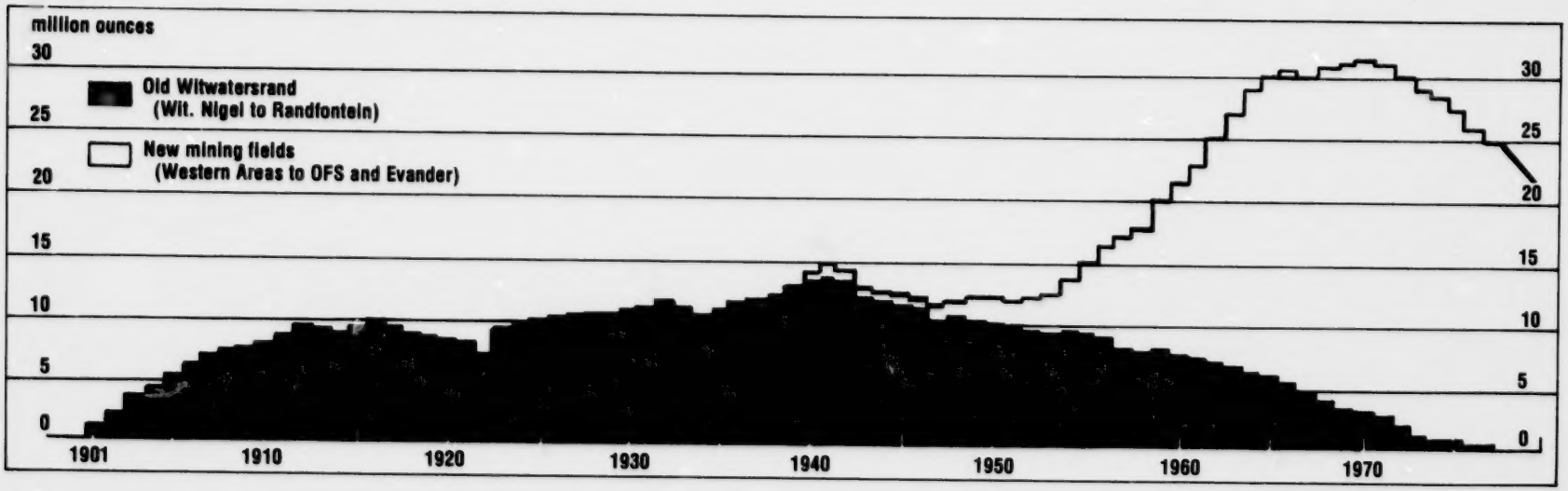
Eight years ago, in early 1973, the President of the South African Chamber of Mines said that he expected South African gold productions to have fallen to 810 metric tons in 1982 and to 650 metric tons by 1987.

As things turned out, the South African gold output rate had dropped to below 650 tons by early 1981—SEVEN YEARS EARLIER THAN THE FORECAST.

Whether one estimates future output capability at an assumed current gold price of U.S.$300, rising to U.S.$400 per troy ounce in 1984 which then remains constant, i.e. in real terms, until the year 2000, or takes U.S.$450 an ounce in current terms, rising to U.S.$550 by 1984 which then remains constant, as above, until 2000, the outcome is an astonishingly identical result, i.e. AGGREGATE SOUTH AFRICAN GOLD OUTPUT WILL NOT EXCEED ABOUT 700 METRIC TONS A YEAR AND WILL GRADUALLY DECLINE FROM THAT LEVEL TO AROUND 595 TONS NINE YEARS FROM NOW, 460 TONS IN 1995 AND TO AROUND 360 METRIC TONS A YEAR BY 2000.

The head of the gold and uranium division of the Anglo-American Corporation of South Africa said in September, 1980 that the mines of that country will be able to produce

The biggest producer South Africa's gold—past production and forecast



an average of 650 metric tons of gold a year to the year 2003, (assuming a price of at least U.S.$650 per ounce).

THE PRESENT PRODUCTION LEVEL COULD, IN ROUND TERMS, REMAIN UNTIL ABOUT 1987, WHEN IT SHOULD DROP OFF IN THE ABSENCE OF NEW MARKET FACTORS. IT WILL THEN *DECLINE* GRADUALLY *TO* ABOUT *350 METRIC TONS OF GOLD A YEAR BY 2000, IN THE OPINION OF THE SOUTH AFRICAN CHAMBER OF MINES,* WITH SOUTH AFRICA DELIVERING ABOUT 25 TONS LESS TO THE MARKET IN EACH YEAR FROM 1987 ONWARDS.

A third of the existing gold mines may have closed down by the year 2000.

As its gold mining activities wind down, South Africa plans to find funds for growth in production of other metals. There is no question that South Africa will continue to strengthen its position in the overall minerals supply picture in the future. In the last few years the mining industry has gone through a remarkably rapid rate of expansion. In part this has been reflected in the rapid rate of mineral sales, which increased in value by about 27 per cent in 1978 and by a record rate of nearly 45 per cent in 1979 to a level of about R9.7 billion. 1 Rand = U.S.$1.3115, February 4, 1981.

While this rate of growth is expected to slow somewhat to about 20 per cent during the early 1980's, it is, apart from a further development of new *gold* mining projects, likely to concentrate more on the exploitation of other minerals, like lead, coal, uranium, iron ore and chrome ore. To this end, therefore, South Africa could feature even more prominently as a "minerals supermarket" to the West than ever before.

In South Africa, the gold leaves the mine as large bricks of crude bullion—about 88 per cent gold, with inclusions such as even more valuable platinum, as well as its sister metals. The bricks go to the Rand Refinery, the world's largest gold refinery, for reduction to pure gold of 99.5 per cent purity or better, in 400 troy ounce (12.5 kilogram) bars.

It is interesting to note here that a small amount of the extremely valuable platinum group metals is recovered from the ore from the gold mines, particularly in the Evander area. However iridium, one of the platinum group metals, is not very soluble in gold and may appear as undesirable black spots or specks on the surface of the gold bars refined at the Rand Refinery in South Africa.

5.13.1 SOUTH AFRICA—NEW DISCOVERIES

In South Africa, in mid-1980, at Bank Gold, 35 miles southwest of Johannesburg, Texasgulf completed a drill hole which encountered the Ventersdorp Contact Reef at a depth of 3,150 feet with a 13-inch interval that assayed 2.25 ounces of gold and 2.11 ounces of silver per metric ton. (Compare Kidd Creek, Ontario, at 3,400 feet, 1.5 ounces of silver per ton, average.) Three side track or deflection holes were also drilled which intersected the Reef within a few meters of the first hole.

The first deflection hole had 12 inches of 6.38 ounces of gold and 0.69 ounces of silver per ton; the second had 16 inches with 0.87 ounces of gold and 0.29 ounces of silver; and the third had 8 inches of 6.31 ounces of gold and 1.05 ounces of silver. The average grade over a mining height of 39 inches (one meter) would be 1.10 ounces of gold and 0.34 ounces of silver per metric ton.

The hole was drilled on the southern portion of a narrow 135 acre strip of land owned by Texasgulf, 2,600 feet north of the East Driefontein gold mine workings. The 135 acres is surrounded by land held by Gold Fields of South Africa and the Far West Rand Dolomitic Water Association. Texasgulf also has mineral rights or options on several other tracts in the immediate area which are being explored.

SOUTH AFRICAN GOLD MINING STATISTICS

Gold	1978	1979
Metric tons milled (000)	78,157	83,529
Grade g/ton	8.85	8.19
Production (kg)	704,479	702,830
Value (R000)	3,863,050	5,666,336
Working costs (R000)	1,930,451	2,294,989
Per ton milled (R)	24.70	27.48
Per kg (R)	2,792	3,464
Working profit (R000)	1,801,515	3,100,898

URANIUM AT GOLD MINES

Tons treated (000)	21,976	26,096
Grade (kg/ton)	0.171	0.168
Production (000 kg)	4,531	5,539
Profit (R000)	143,890	208,928

Lower revenues from uranium recovery in 1981 are expected by the gold mines.

LIFE PROSPECTS OF PRINCIPAL SOUTH AFRICAN GOLD MINES

(While the Free Market Gold Price is around U.S.$600 per troy ounce.)

SOUTH AFRICAN MINES—GOLD AND URANIUM

n.b. Most of these individual gold mines are producing less gold per year than in 1973. Exceptions are Vaal Reefs, Hartebeestfontein and Western Areas.

Mine Life at Current Milling Rates	Company	Year Output Started	Gold Output Per Year (Metric Tons)	COMMENTS
LONG LIFE MINES				(1 Rand = U.S.$1.3115, February 4, 1981)
*beyond 1997 *President Brand*, O.F.S. (a "super" mine)	Anglo-American Corp. of South Africa, formed in 1917	1954	29.7 (1980)	Capital expenditure: R332.3 million. Has an 180,000 ton per month uranium plant. One of the *lowest cost uranium producers in the world*; 540 metric tons per annum. U_3O_8 capacity. Considerable lower grade ore available.
beyond 1996 *President Steyn*, O.F.S.	Anglo-American	1954	36.0 (1980)	Gold, uranium. Outlook good. Capital expenditure: R169.6 million. A problem mine: staffing, underground fires etc.
beyond 2002 *Western Deep Levels*	Anglo-American	1962	45.6 (1980)	*The world's deepest mine* of any kind, over 4,000 metres. New shaft will go to 14,000 feet and may eventually go to 17,000 feet. (Already mining at 12,500 feet.) New shaft will cost over R1 billion, (approximately U.S.$1.3 billion) when completed in 1992. Deepest vertical shaft in the world. Average grade 14.8 g. gold per ton, Carbon Leader. *Uranium:* 180 metric tons per annum U308. Outlook excellent. R28.4-million was spent at number one shaft.
beyond 1993 *Vaal Reefs* Klerksdorp, (a "super" mine) (includes *Western Reefs*)	Anglo-American	1956	69.9 (1980)	The *largest tonnage* gold mining operation in the world, 5 million tons per year. (Produces more gold than all of Canada's gold mines combined.) New shaft June 1974. Vaal Reefs is also the largest producer of profitable by-product *uranium oxide*. Its two re-opened *uranium* plants are operating at full capacity. U308 capacity: 1,608 metric tons p.a. Further expansion planned. R454 million.

An incredible mine. The first gold mine in history to have over U.S.$1 billion in revenues (in 1980). 9 shafts. 44,000 employees. 1980 output: *69.876 metric tons of gold.*

At Vaal Reefs, a suggestion to step up monthly production by 60,000 tons a month is being investigated.

LIFE PROSPECTS OF PRINCIPAL SOUTH AFRICAN GOLD MINES (Continued)

Mine Life at Current Milling Rates	Company	Year Output Started	Gold Output Per Year (Metric Tons)	COMMENTS
beyond 1998 **Hartebeestfontein* Klerksdorp. (incl. *Zandpan*)	Anglo-Transvaal	1955	32.2	Fifth largest producer of *uranium*; 650 metric tons p.a. U308 capacity; New plant and development R30 million.
beyond 1991 *Loraine*, O.F.S. (had loan from Anglo-American; flexibility in grade that can be mined)	Anglo-Transvaal	1955	5.3 (1980)	R80 million expansion to double output, by 1985.
beyond 1991 *Libanon*	Consolidated Gold Fields, London, U.K., (through Gold Fields of South Africa, 49% owned.) —founded by Cecil Rhodes.	1949	10.8 (1980)	R94 million expansion by 1987. Life extended beyond 1991. 12.9 g gold per metric ton.
Amcon Group Inc. is the new (1979) name of Gold Fields American Corp., the North American operation of the Consolidated Gold Fields group which embraces Gold Fields of South Africa.				
Anglo-American is to raise its holdings in Gold Fields to 29.9 per cent, the maximum legal limit without a formal bid.				
beyond 2010 *Kloof*	Consolidated Gold Fields	1968	30.2 (1980)	World's tallest mine headgear, 256 feet. *Deep*. Pressure bursts; costs. *One of the three richest gold mines*, 0.44 ounce per ton. Huge ore reserves. Great potential.
beyond 2006 *East Driefontein*	Consolidated Gold Fields	1972	39.3 (1980)	Very promising large mine. *Second richest* gold mine in the country, average grade 19.6 g per ton. Planned capacity reached in 1976. Potentially one of the world's largest producers. Very low costs. South Africa's lowest cost gold producer. 1980 operating cost U.S.$75 per ounce gold.

LIFE PROSPECTS OF PRINCIPAL SOUTH AFRICAN GOLD MINES (Continued)

Mine Life at Current Milling Rates	Company	Year Output Started	Gold Output Per Year (Metric Tons)	COMMENTS
to 1993/2001 *West Driefontein* (a "super" mine)	Consolidated Gold Fields	1952	43.8 (1980)	*Richest (average grade) gold mine* in the world. The world's most profitable gold mine. Rich ore, average grade 21.8 g gold per ton. *World's second largest* single producer of gold. *Uranium:* 270 metric tons p.a. U_3O_8 capacity. Lease extension probable.
EAST AND WEST DRIEFONTEIN ARE TO MERGE ON JULY 1, 1981, FORMING THE WORLD'S LARGEST SINGLE COMPANY PRODUCING GOLD. A BORDERING AREA, "NORTH DRIEFONTEIN," WILL BE DEVELOPED.				
beyond 1993 *St. Helena*, O.F.S.	Union Corporation	1951	16.6 (1980)	Outlook improved. Lease extension probable.
beyond 2001 *Winkelhaak* Evander	Union Corporation	1958	14.2 (1980)	Steady output. Lease extension expected.
beyond 1998 *Kinross* Evander	Union Corporation	1968	9.0	*Deep*; life extended considerably. Major expansion likely.
beyond 2003 **Randfontein Estates*	Johannesburg Consolidated Investments —founded by Barney Barnato.	1924	20.8 (1980)	Second largest uranium producer. World's largest heap of slime, 38 million tons. Mine reopened 1972; *deep*; was once the world's largest gold mine—closed in 1967. New No. 3 $200MM shaft for a new ore-body, 1985. Grades and tonnages exceed expectations. Up to a 20 year life; by-product uranium.
to 1984/1993 **West Rand Consolidated*	Johannesburg Consolidated Investments	?	2.6 (1980)	Had the *highest grades of uranium* in the country. The *uranium* section was the second largest *single primary* producer of uranium in the country, 550 metric tons p.a. U308 capacity. State assistance received R2.6 million in 1978. Depends on uranium.

LIFE PROSPECTS OF PRINCIPAL SOUTH AFRICAN GOLD MINES (Continued)

Mine Life at Current Milling Rates	Company	Year Output Started	Gold Output Per Year (Metric Tons)	COMMENTS
MEDIUM LIFE MINES				
to 1997/2011 *Free State Geduld*, O.F.S. (a "super" mine)	Anglo-American	1956	32.2 (1980)	Has had the world's richest grades found in a gold mine. 75 g gold per ton in the S.W. corner. Medium life-extension. Capital expenditure: R592.5 million, including $150 million for sinking new No. 5 shaft, ready 1981. Uranium.
			Ore grade was:	
		1971	27.0 g. per ton	
		1976	16.4 g. per ton	
		1980	11.5 g. per ton	
	It is no longer considered to be a rich mine.			
to 1991/1998 **Blyvooruitzicht*	Barlow Rand (Rand Mines)	1942	18.0 (1980)	Rich. Average grade 9.3 g gold per ton. *Uranium*: 138 metric tons p.a. U308 capacity. Costs rising fast. R31.7 million expansion by 1982.
to 1984/1991 *Durban Roodeport Deep*	Barlow Rand (Rand Mines)	1898	7.2 (1980)	Old, very low grade.
**Harmony* (includes Merriespruit and Virginia)	Barlow Rand (Rand Mines)	1954	31.2 (1980)	Fourth largest uranium producer. Largest *primary* producer of uranium. R136 million expansion by 1983. Uranium earnings fall. R152 million expansion, 1987.
to 1997/2003 *Doornfontein*	Consolidated Gold Fields	1953	12.2 (1980)	
to 1986/1993 *Venterspost*	Consolidated Gold Fields London (through Gold Fields of South Africa, 49% owned)	1930	5.9 (1980)	Life presently extended by higher gold price. New ground possible.
to 1999/2004 **Buffelsfontein* Klerksdorp	General Mining Union Corp. Group	1957	26.6 (1980)	Third largest producer of by-product *uranium*; 710 metric tons p.a. U308 capacity. Uranium of declining importance. New R100 million shaft system by 1983.

LIFE PROSPECTS OF PRINCIPAL SOUTH AFRICAN GOLD MINES (Continued)

Mine Life at Current Milling Rates	Company	Year Output Started	Gold Output Per Year (Metric Tons)	COMMENTS
to 1999/2011 *Western Areas* (includes Elsburg)	J.C.I. (Johannesburg Consolidated Investment Group)	1961	19.5 (1980)	*Deep*. Water problems in 1972. Sufficient reserves to continue. R50 million development by 1983.
to 2001 *E.R.P.M.* *(East Rand Proprietary Mines)*	Barlow Rand	1894	11.7 (1980)	*Old. 11,483 feet deep*. Was the world's deepest mine. Was subsidized; requested additional State aid. $390MM expansion considered. Will become nation's fourth largest gold mine—1986 to 1990.
SHORT LIFE MINES				
to 1989/1999 *Stilfontein* Klerksdorp	General Mining Union Corporation Group	1952	17.4 (1980)	Extension unlikely. Was subsidized. Stilfontein's promise stems more from uranium than from gold.
to 1985/1991 *Grootvlei* (managed jointly with Marievale)	General Mining Union Corporation Group	1938	6.0	Life extended. *Lowest grade*, 3.5 g. per metric ton, *in the industry*. Reopening closed areas and expanding mill.
Marievale	General Mining Union Corporation Group	1938	1.3 (1980)	Rising water table. May close.
beyond 1984 *Leslie* Evander	General Mining Union Corporation Group	1962	3.7	
Bracken Evander	General Mining Union Corporation Group	1962	3.5	Closes by 1983.
Wit Nigel	Independent	1940	1.0	
OTHER MINES				
Elandsrand	Anglo American	1979 R231.7 million capital expenditure	5.2 (1980)	*Adverse trend in development values*. 34 year mine life estimated. 5.04 g. per ton.
Deelkraal (adjacent to Elandsrand)	Gold Fields	new R150 million	3.1 (1980)	Trial milling December 1979. *Disappointing ore grade to date*. Labour unrest caused output setback.

LIFE PROSPECTS OF PRINCIPAL SOUTH AFRICAN GOLD MINES (Continued)

Mine Life at Current Milling Rates	Company	Year Output Started	Gold Output Per Year (Metric Tons)	COMMENTS
Unisel at Jurgens Hof.	General Mining Union Corporation (Unisel Gold Mines, O.F.S.)	1979	5.7 (1980)	Already producing in excess of its design capacity. Ore treated at St. Helena.
Barberton	General Mining Union Corporation Group (Selection Trust 34%)	n.a.	1.5 (1980)	
Western Holdings, O.F.S. (a "super" mine)	Anglo-American	1953	28.5 (1980)	(To be the operating arm of a large new mining com- (plex, Eastern Gold, to include the new low-grade *Erf-* (*deel* mine and involving other mines. Capital expen- (diture R58 million. Uranium.
Welkom, O.F.S.	Anglo-American Corporation	1951	11.3 (1980)	((R175.9 million capital expenditure. *Uranium* slimes (go to the President Brand mine. Part of a new mining (complex, Eastern Gold.
F.S. Saaiplaas	Anglo-American			(Capital expenditure R93.8 million.
Eastern Gold Holdings (East Hold) Erfdeel/Dankbaaarheid area, Welkom, O.F.S.	Anglo-American 44.5%; Duiker Exploration (Lonrho) 36%; Anglo-American Gold Inv. (Amgold) 9.5%, Western Holdings 10%	(about 11 metric tons of gold a year from 1986/87)		(R400 million (U.S.$530MM). Large new low grade (mine to be developed in the near future. Part of a (larger complex resulting from merger of *Welkom* and (*Free State Saaiplaas* into *Western Holdings* opera- (tions. (Western Holdings has been paying 60 per cent (of its profits in taxes.) Eventually 2.4 million tons per (annum.
The new Western Holdings complex will become *the largest gold mining company in the world in terms of mill throughput*. Reserves appear sufficient to support a mining operation for about 28 years, allowing for a 5-year build up to full mill capacity at the Erfdeel-Dankbaarheid area immediately north of F.S. Saaiplaas, which will all be part of the new complex.				((Work on the first shaft at Basal Reef will start late in (1982; mine on stream in 1988. Au 4.5 g per metric (ton. Start up cost: U.S.$532 million. (Sinking of second shaft to start in 1988.
Beatrix Mines new gold mine Farm Leeuwbult	General Mining Union Corporation, controlled by Federale Mynbow	by 1985		R320 million (U.S.$415MM). New mine development. Eventually 2 million tons per annum. 3,000 feet.
Beisa Mines, new uranium mine. Farm Palmietkuil, O.F.S., 25 km south of Welkom	General Mining Union Corporation	by 1981		Pre-production: Rand 250 million. Developing new uranium mine, eventually 1.2 million tons per annum. Gold is a byproduct Sinking of No. 1 shaft reached 1,000 m. Water hampers further sinking.

LIFE PROSPECTS OF PRINCIPAL SOUTH AFRICAN GOLD MINES (Continued)

Mine Life at Current Milling Rates	Company	Year Output Started	Gold Output Per Year (Metric Tons)	COMMENTS
Afrikander Lease Klerksdorp, Transvaal	Vaal Reefs/Amgold	by 1981		R150 million. Initial uranium-gold output to be treated at Vaal Reefs until plant is ready.

The famous Rothschild merchant bankers are part of a consortium underwriting a R20 million rights issue announced by GGMA (Government Gold Mining Areas) on the East Rand.

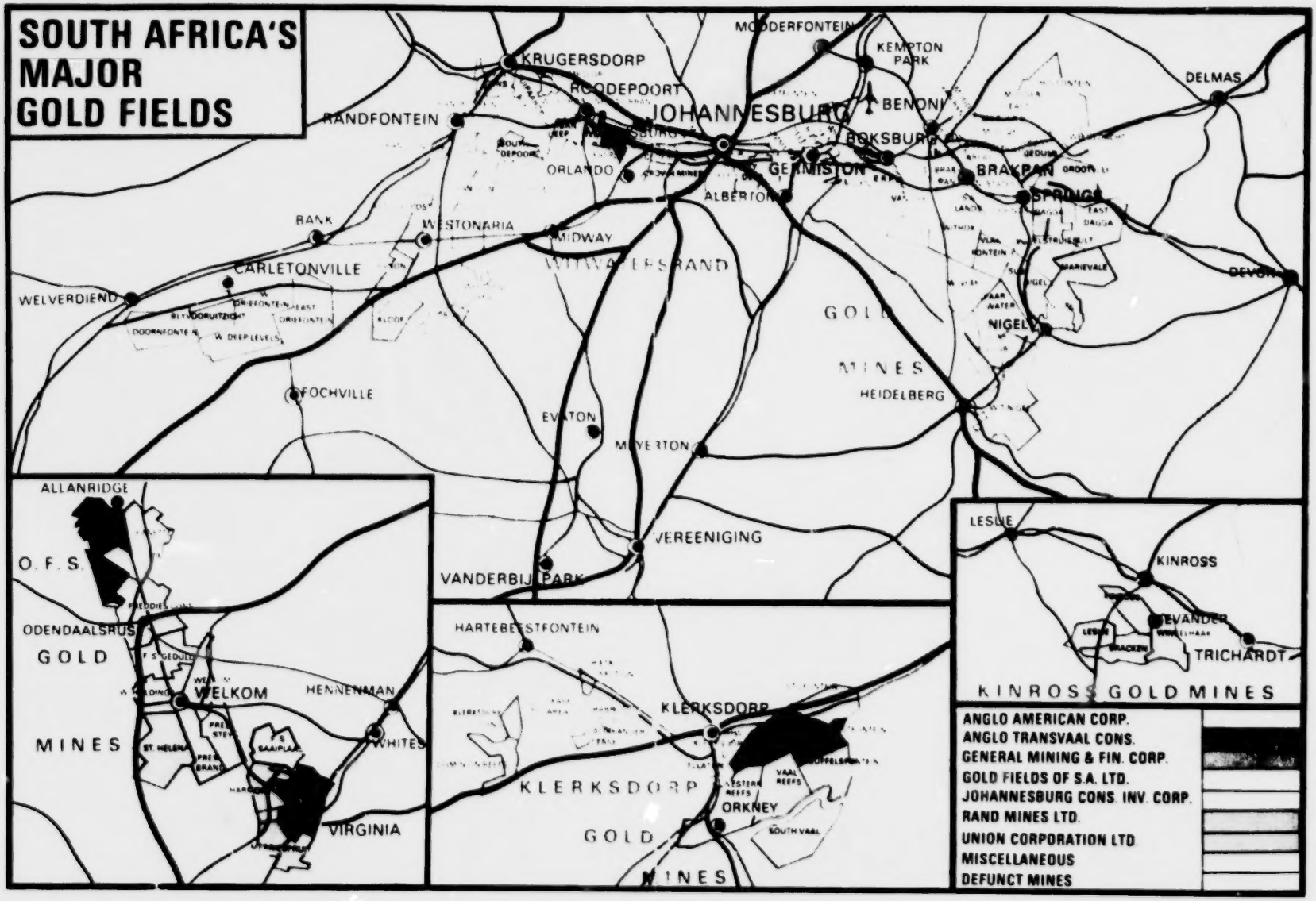
	Company	Location	Project	Capacity Planned Now	Units	Investment
Rehabilitating Simmer and Jack mine.	Anglo American	Johannesburg, S. Africa	U Ground	150MM	mtpm ore	U.S.$66MM

Mining has commenced at the Minador gold mine, (Jimberlana Minerals of Australia to earn 40 per cent), near Randfontein. Initial grade is 4.5 g per metric ton.

* *Uranium producers*

Most of South Africa's uranium production is a byproduct of gold mining. It is understandably the cheapest uranium to produce in the Western World.

N.B. All of the Evander field is controlled by Union Corporation. Evander area mines are shallow and patchy.

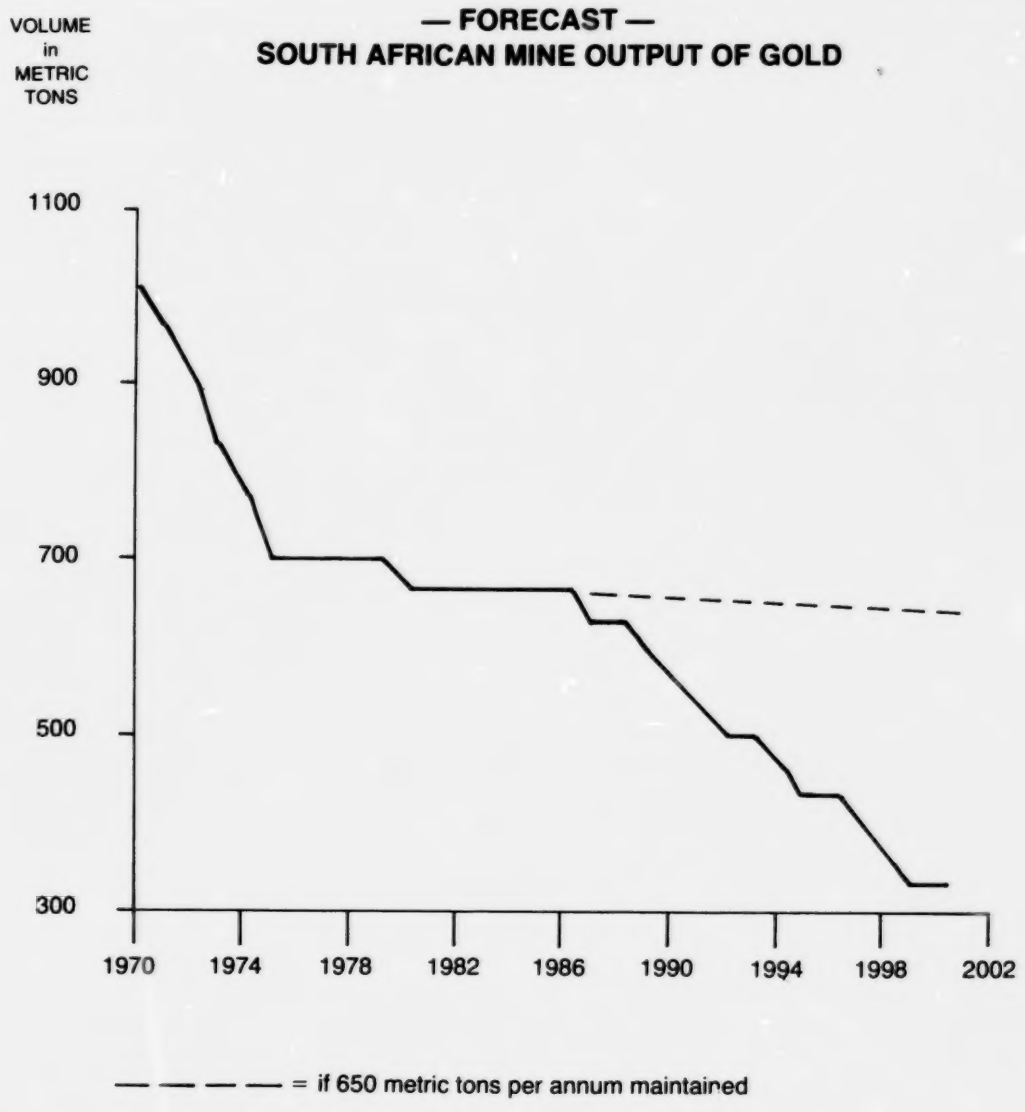

SOUTH AFRICA'S MAJOR GOLD FIELDS
KRUGERSDORP
MODDERFONTEIN
KEMPTON PARK
DELMAS
ROODEPOORT
RANDFONTEIN
JOHANNESBURG
BENONI
BOKSBURG
ORLANDO
GERMISTON
BRAKPAN
SPRINGS
ALBERTON
BANK
WESTONARIA
MIDWAY
CARLETONVILLE
WITWATERSRAND
GOLD
MINES
WELVERDIEND
DEVON
NIGEL
FOCHVILLE
HEIDELBERG
EVATON
MEYERTON
VEREENIGING
VANDERBIJLPARK
ALLANRIDGE
O. F. S.
ODENDAALSRUS
GOLD
MINES
WELKOM
HENNENMAN
WHITES
VIRGINIA
HARTEBEESTFONTEIN
KLERKSDORP
ORKNEY
LESLIE
KINROSS
EVANDER
TRICHARDT
KINROSS GOLD MINES
ANGLO AMERICAN CORP.
ANGLO TRANSVAAL CONS.
GENERAL MINING & FIN. CORP.
GOLD FIELDS OF S.A. LTD.
JOHANNESBURG CONS. INV. CORP.
RAND MINES LTD.
UNION CORPORATION LTD.
MISCELLANEOUS
DEFUNCT MINES

Estimates of Ore Reserves South African Mines	Calculated on the basis of a gold price per kilogram of Rand	metric tons 1 000	Fully Developed or Blocked Out Grade Gold grams per metric ton	Uranium Oxide kilograms per metric ton	Stoping width centimetres
Blyvooruitzicht ..... (a)	6 430	5 020	22,1	0,224	105,4
Bracken-Kimberley Reef ..... (a)	5 500	1 400	7,3		133
	7 500	2 500	5,7		133
Buffelsfontein ..... (e)	13 070	11 457	10,30	0,321	151
Doornfontein ..... (e)	7 200	3 658	11,6		109
Durban Deep ..... (b)	8 038	4 529	5,8		138,5
East Driefontein ..... (b)					
Ventersdorp C.R.	6 050	5 851	23,4		180
Carbon Leader	6 050	238	9,5		119
Main Reef	6 050	547	9,9		169
E.R.P.M. ..... (b)	8 038	6 832	7,6		138,2
Elandsrand ..... (d)	6 810	490	11,22		124,1
	7 220	504	11,04		123,9
	7 630	504	11,04		123,9
Free State Geduld ..... (a)	6 810	7 749	17,49	0,09	124,8
	7 220	8 195	16,85	0,09	124,6
	7 630	8 651	16,27	0,09	126,0
Free State Saaiplaas ..... (a)	6 810	1 644	6,46	0,25	125,5
	7 220	1 756	6,33	0,24	126,0
	7 630	1 997	6,06	0,23	127,1
Grootvlei ..... (c)					
Kimberley Reef	5 500	1 500	6,3		132
	7 500	3 000	4,6		132
Main Reef	5 500	200	4,2		132
	7 500	1 000	3,3		132
Harmony ..... (a)	6 430	19 767	7,4	0,170	130,9
Hartebeestfontein ..... (e)	13 069	13 242	12,2	0,23	112
Kinross-Kimberley Reef ..... (a)	5 500	4 700	8,2		138
	7 500	6 300	7,1		138
Kloof ..... (e)	7 200	3 765	18,7		151
Leslie-Kimberley Reef ..... (a)	5 500	1 600	5,8		127
	7 500	3 200	4,6		127
Libanon ..... (e)	7 200	4 166	12,9		143
Loraine ..... (c)	8 510	3 598	9,7		109
Additional (not included above)		282	6,8		
Marievale ..... (c)					
Main Reef	5 500	10	5,2		140
	7 500	20	4,4		140
Kimberley Reef	5 500	100	6,1		140
	7 500	180	5,2		140
President Brand ..... (a)	6 810	9 037	13,62	0,09	151,2
	7 220	9 360	13,33	0,09	151,2
	7 630	9 588	13,13	0,09	150,7
President Steyn ..... (a)	6 810	12 632	10,64	0,10	152,4
	7 220	13 136	10,40	0,10	153,4
	7 630	13 576	10,20	0,10	154,0
Randfontein ..... (b)					
Cooke No. 1 Shaft	9 960	2 620	11,1	0,153	190
Cooke No. 2 Shaft	9 960	1 813	5,1	0,332	186
Randfontein-Section	9 960	1 247	2,2	0,450	86

Estimates of Ore Reserves South African Mines		Calculated on the basis of a gold price per kilogram of Rand	metric tons 1 000	Fully Developed or Blocked Out		
				Grade		Stoping width centimetres
				Gold grams per metric ton	Uranium Oxide kilograms per metric ton	
St. Helena-Basal Reef	(a)	5 500	8 100	14,1		168
		7 500	10 900	11,6		168
Stilfontein	(e)	13 070	6 281	9,85	0,149	120
Unisel-Basal Reef	(a)	5 500	500	9,0		200
		7 500	700	8,9		200
Vaal Reefs	(d)					
Vaal Reef		6 810	20 169	14,22	0,40	110,8
		7 220	20 509	14,09	0,39	110,6
		7 630	20 851	13,95	0,39	110,5
V.C.R. & Elsburg Reef		6 810	2 804	5,32		124,9
		7 220	3 502	4,98		129,8
		7 630	4 372	4,69		129,6
Venterspost	(e)	7 200	2 709	7,9		162
Welkom	(a)	6 810	5 308	9,96	0,12	125,1
		7 220	5 689	9,61	0,12	125,9
		7 630	6 092	9,27	0,12	126,6
West Driefontein	(e)	7 200	5 402	21,8		122
Western Areas	(b)	9 960	11 767	6,4		195
Western Deep Levels	(d)					
Carbon Leader		6 810	2 898	24,60	0,25	102,4
		7 220	2 898	24,60	0,25	102,4
		7 630	2 936	24,38	0,25	102,4
Ventersdorp C.R.		6 810	2 340	13,25		133,7
		7 220	2 395	13,10		133,1
		7 630	2 461	12,92		132,5
Western Holdings	(a)	6 810	8 840	15,32	0,08	135,6
		7 220	9 007	15,11	0,08	135,6
		7 630	9 174	14,92	0,08	135,8
West Rand Cons.	(b)					
Gold Section		9 930	410	6,51		121
Uranium Section		9 930	790		0,902	86
Winkelhaak-Kimberley Reef	(a)	5 500	7 700	9,2		157
		7 500	9 400	8,3		157
Wit Nigel	(e)	12 400	1 400	5,36		93

(a) — Estimates dated as at 79.6.30
(b) — Estimates dated as at 79.12.31
(c) — Estimates dated as at 79.9.30
(d) — Estimates dated as at 79.7.31
(e) — Estimates dated as at 80.6.30

n.b. The published ore reserves of the gold mines in South Africa are the reserves indicated by underground sampling of development on reef or advancing stope faces. They are *not*, therefore, an indication of the life of the mine.

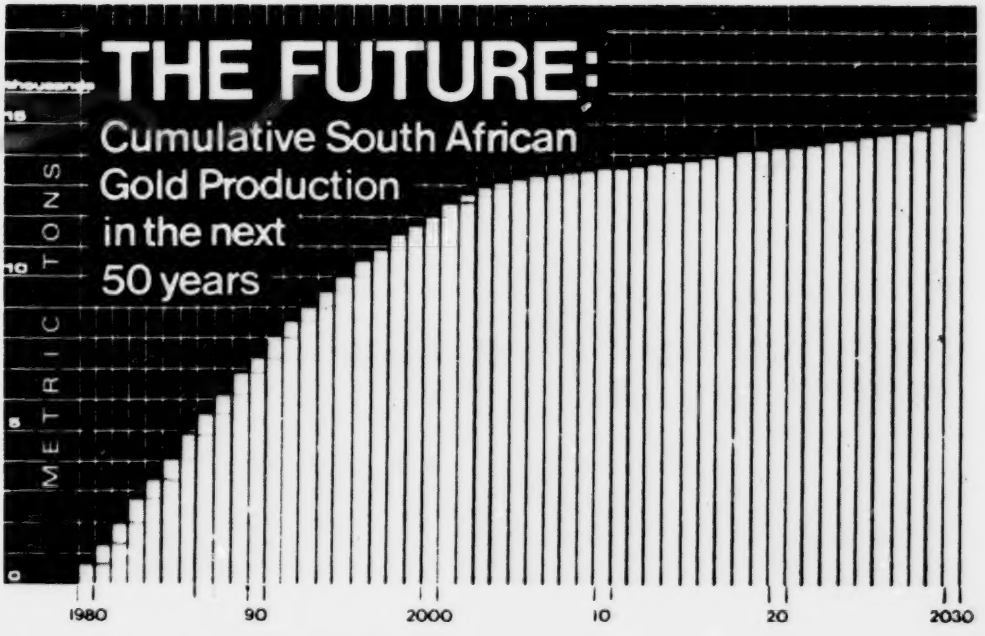


The world will be increasingly short of gold from 1987 on, as South Africa mine output declines.

Existing gold mine operations and exploration activity will continue at or about current volume levels but there will be a long term decline in the output of gold bullion. Current free market prices have modified the slope of the decline but *not* the general output trend in South Africa. ONE THIRD OF THE EXISTING GOLD MINES MAY HAVE CLOSED DOWN BY 1999.

Any massive new discovery of gold would change this, of course.

This chart does not take into account possible future damage to South African mine output levels due to civil unrest, sabotage etc.



Source: Mining Survey, South Africa

Government Miners' Training Schools

A number are established along the Rand for the training of skilled gold miners. Unemployment among the black South Africans is becoming an increasing social and political problem.

Population

South Africa has experienced an unprecedented growth in population during the last few decades. This is likely to increase even more substantially in the foreseeable future.

The total population will have grown from 22 million in 1970 to some 50 million in the year 2000 and to an estimated 81 million by 2020.

The most rapid growth will continue to be that of the blacks, who will comprise some 86 per cent of the population by year 2000. 40 million people will live in cities and towns, of whom 34 million will be Blacks.

The Black population grew from 3.5 million in 1904, just after the Boer War, to 14.5 million by 1970 and will triple their numbers to 43 million by 2000, (or 12 times their numbers in 1904).

As late as 1970, the ruling Whites still numbered less than 4 million. Whites were 22 per cent of the population in 1904, but less than 16 per cent in 1970.

Even if one considers that rates of population increase typically decline as living standards improve—and that this is likely with the South African blacks—the slope of the increase in the black population would be modified, but not the general upwards trend vis-a-vis the whites.

The potential for increasing unrest and civil disorder, inevitably involving gold mines, whose output, (and therefore employment), must fall after 1986, is clearly there.

Mine Labour Costs in South Africa

Companies are pursuing mechanization, because of the rising costs of labour. Equal employment policy is being introduced by some mines.

A major problem is the policy of the white MUZ, (Mine-Workers Union). White South African gold mine workers have been earning the equivalent of more than U.S.$1,000 per month since July 1, 1978 under a wage settlement negotiated by a conciliation board. A 6 per cent wage increase raised miners' pay to about $1,033 per month. Pay raises for base metal and platinum miners usually follow the pattern set by the gold mining industry.

The white/black pay differential has narrowed from almost 20 in 1970 to 6.7 in 1979. Pay levels in mining—for whites and blacks—have been rising at faster rates than in the economy generally. Black mineworkers have no negotiating machinery, but were granted a 10.7 per cent wage hike in 1977, to the equivalent of about U.S.$124 per month.

The South African Chamber of Mines announced in July, 1979 that over 430,000 workers in gold mines and certain platinum mines would get increases in pay. Mines continued to be overrun by unemployed blacks seeking work.

399,123 blacks were employed in gold mines in 1979, highest in a decade. 215,577 were from South Africa and the balance from neighbouring countries, particularly Lesotho (Basutoland) 94,379 and Moçambique 38,995. In some gold mines, refrigeration will continue to be required for many years. In the gold mines to the south, at a depth of 3,000 metres or more, there is a high rock temperature and autocompression of the air at that level.

The Chamber of Mines, the gold industry organization, estimated that two new gold mines could have been opened in 1980 if only 1,000 skilled workers could be found.

Disruptions

A DENIAL OF OIL TO THE ECONOMY OF SOUTH AFRICA BY THE MIDDLE EAST, CIVIL WAR OR CIVIL DISORDER IN SOUTH AFRICA OR AN INVASION COULD EACH SERIOUSLY DISRUPT GOLD OUTPUT AND PUSH UP THE WORLD PRICE. ALTHOUGH THERE ARE OVERWHELMINGLY LARGE ABOVE-GROUND STOCKS OF METAL READY FOR SALE AS GOLD BULLION, MANY HOLDERS WOULD NOT SELL IN SUCH CIRCUMSTANCES.

South Africa's liquid fuel resources are virtually non-existent, in contrast to the country's abundance of other mineral resources. A certain amount of coal is converted to oil by the SASOL method. There were damaging attacks on SASOL installations in 1979.

The most likely targets for dissident blacks will probably be foreign-controlled companies, because that is where the international leverage, the coverage and the notoriety lie. Most South African gold mines are owned locally, but some, like the Gold Fields of South Africa group of mines, West and East Driefontein, Kloof, Deelkraal, Libanon, etc., are U.K.-controlled and are very large.

The 1980 arrival of black rule in Zimbabwe, the country which borders the Republic on the North has naturally been an encouragement to dissidents. The Senate in South Africa has been abolished. The President's Council replaces it—a body with "nominated" White, Indian and Coloured (mixed race) members. Blacks, the majority, are not included.

Counter-sanctions

South Africa has the ability and strength to apply counter-sanctions in extremis. It could deny facilities and assistance to shipping going around the Cape. It could develop the nuclear weapons capability which, it is now accepted, is within its reach.

Such possibilities, however, are remote and would only be considered as extreme answers to extreme actions. They are

probably not a part of a realistic scenario for the immediate future.

What does seem likely is a steady and progressive tightening of the existing sanctions net around South Africa, motivated not in the belief that this will encourage orderly change but, if anything, will bring the opposite: the creation of difficult economic conditions that will promote civil unrest and hasten the downfall of the existing system.

The only worthwhile South African response to this can be to demonstrate a pace of orderly change fast enough to be an acceptable alternative to chaos.

Taxation of Gold and Platinum Mines in South Africa

Taxes on South African mines are levied on profits, as distinct from revenue. Furthermore, capital expenditure on producing mines is effectively regarded as a current cost and thus mines can write off capital expenditure in the year in which it has been incurred. Profits on which tax is paid are, therefore, net profits after all expenditure.

This is an enlightened approach which is recognized in mining circles throughout the world and has no doubt helped contribute to the growth of South Africa's mining industry to its present level.

In South Africa, depreciation and amortization of mining assets are not allowed for tax purposes. Instead, an annual "capital redemption allowance" is allowed in lieu of amortization and depreciation.

In the case of new gold mining ventures—where initial development costs can be as much as Rand 200 million for a large mine—the high risks involved are recognized for tax purposes by the State through the introduction of the so-called "*capital allowance*". This is set at a rate of 10 per cent on the unredeemed balance of capital expenditure. The "*capital allowance*" for tax purposes is presently confined to new *gold* mines in South Africa.

Effectively, it ensures that a new gold mine will not pay tax until all its capital expenditure has been recovered from profits, together with a 10 per cent compound interest return on such capital. Under today's conditions of high inflation and the high risks associated with new mining investments, this 10 per cent return obviously does not nearly cover the full effective cost of such capital. "Cost of capital" is used here in the sense of covering fully the depreciation of the value of the capital through inflation, plus a minimum basic rate of return, in real terms, required from a risky investment such as a new mining venture. Taxation will, therefore, become payable on a new gold mine *before* all costs have been recouped and, in the case of all other mines, before the recoupment of any part of the "cost of the capital investment", but this has not inhibited investment.

A decision to proceed with a new mine, will not be taken unless the prospects are such that at least all costs, inclusive of a realistic "cost of capital", are likely to be recovered. This "threshhold" is referred to as the "flotation pay limit" and is usually expressed in terms of the major uncertain factor in the assessment of the payability of a new mine, i.e. the grade of the ore to be mined.

A venture with an indicated grade above the "flotation pay limit" will be pursued and one with a lower grade will be abandoned or placed in cold storage. The present mining tax system will in all cases tend to raise the flotation pay limit and thus prevent the opening up of marginal ventures which otherwise could have been worth while. In view of the fact that other metal mines do *not* qualify for a capital allowance at all, this effect is more pronounced in their case.

Further tax concessions to the gold mining industry are not expected in the March, 1981 budget. However, aid for financing new mines or major expansion schemes could be featured.

Taxation of Platinum Mines is different from that levied on gold mines in South Africa, although platinum mines do require a government lease. The right to mine all platinum metals is vested in the State.

Redemption of capital expenditure in a platinum mine is on a basis of 25 per cent per annum, (increased by a "processing allowance"), with the balance over the life of the mine. The "processing allowance" is dependent on the degree of refining done in South Africa and for complete refining of metals, 100 per cent is granted. THIS IS THE INCENTIVE PROVIDED IN THE SOUTH AFRICAN GOVERNMENT'S "FURTHER PROCESSING POLICY".

Since depreciation is not allowed, all mines therefore appropriate from the gross profit amounts sufficient to cover replacement of assets, as well as the new development required to maintain ore reserves, or if the mine is expanding, to provide the necessary additional shafts, primary development, equipment and housing.

Mining Taxation

In 1980, the State received from taxation of the gold mines 52 per cent of their profits, compared to 37 per cent in 1977. Dividends to shareholders were 31 per cent of profits in 1980, compared to 27 per cent in recent years.

Some receipts from mining by the South African government during the year ended March 31, 1979:

	Rand	U.S. Dollars
1) on Loan Account —Lease Considerations	195,862,100	254,620,730
2) on Revenue Account— from Taxes on Mining (under Income Tax Act) Gold Mines: i) Formula	758,988,376	986,684,880
Gold Mines: ii) Non-Mining	33,645,581	43,739,255

Taxation paid, total for fiscal 1978-79	R.988.5 million	U.S. $1,285 million
THESE TAX PAYMENTS ARE EQUIVALENT TO ABOUT *18.4 PER CENT* OF GROSS REVENUE (BELOW)		
Working Revenue of Mine Producers of Gold in 1979, (excludes revenue from uranium and sulphuric acid, but includes silver revenue).	R.5,377 million	U.S.$6,983.6 million

SOUTH AFRICA'S ROLE IN THE WESTERN WORLD'S MINERAL SUPPLY

Mineral Commodity	Mine Production (1979) World Rank			In-Ground Reserves (1979) World Rank			Exports Western World Rank	
	Estimate by U.S. Bureau of Mines	Estimate by South African Minerals Bureau		Estimate by U.S. Bureau of Mines	Estimate by South African Minerals Bureau			
	%		%	%		%		%
Gold (metal)	58	1st	53	48	1st	51	1st	67
Platinum group metals	46	1st	51	73	1st	75	1st (value)	91
Vanadium (metal)	39	1st	45	19	1st	49	1st	73
Chrome ore	34	1st	36	68	1st	81	1st	40
Ferrochrome	—	—	—	—	—	—	1st	58
Manganese metal	—	—	—	—	—	—	1st	67
Manganese ore	23	1st	22	37	1st	78	1st	36
Ferromanganese	—	2nd	12	—	—	—	1st	22
Antimony (metal)	—	2nd	20	—	2nd	—	2nd	7
Vermiculite	—	—	—	—	—	—	2nd	—
Titanium (ilmenite, rutile)	—	3rd	18	—	5th	—	3rd	20
Uranium (metal)	—	3rd	11	—	2nd	—	3rd	20
Zirconium (concentrate)	—	3rd	11	—	3rd	—	3rd	9
Iron ore	—	7th	5	—	6th	—	7th	5
Nickel (metal)	—	5th	5	—	5th	—	7th	3
Cobalt	—	—	—	—	5th	—	—	—
Copper (metal)	—	8th	3	—	11th	—	7th	3
Tin (metal)	—	8th	2	—	11th	—	9th	1
Zinc	—	—	—	—	4th	—	—	—
Lead	—	—	—	—	4th	—	—	—

The importance of South Africa as a source of many key minerals for the world is illustrated by this table.

The table ranks South Africa's role in Western World supply in terms of mine production, reserves and exports.

In terms of mine production, the country ranks number one in the case of several minerals and ranks two and three in other minerals, respectively—again placing South Africa in a key position as a mineral producer.

Where reserves are concerned, South Africa does not hold as prominent a rank as in the other categories. Nevertheless, its level of mineral reserves in terms of the commodities listed indicate that it remains a potential source of "strategic" minerals of the utmost importance to the West.

In terms of exports it will be seen that South Africa takes the lead in the supply of no less than 8 of the minerals listed.

Major countries in Western Europe, as well as Japan and the U.S. are beginning to compete for access to vital natural resources and South Africa is the new cockpit of the world in that regard, as more and more political crises impact on this issue.

There are 7 important minerals for which South Africa accounted for more than a third of Western mine production in 1976: gold, platinum, chrome, vanadium, manganese, aluminum silicate and vermiculite. South African gold and platinum are at least three quarters of free world mine output and vanadium well over half.

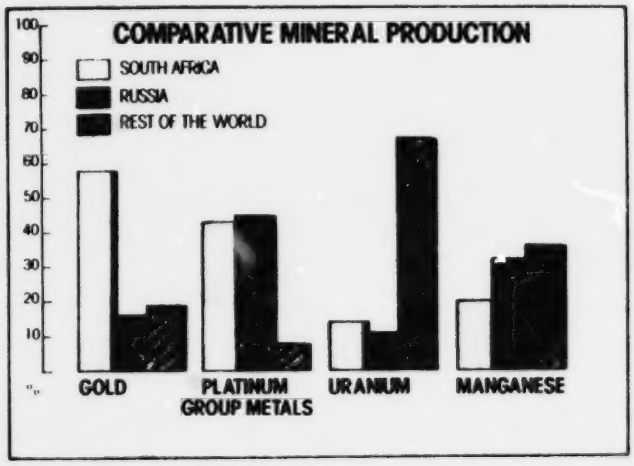
n.b. The major alternative supplier nation of gold, platinum, chromium and vanadium is the Soviet Union.

South Africa has the free world's largest reserves of gold, the platinum group metals, chrome, manganese and fluorspar.

Wilson Borden of Bryn Mawr has pointed out that if the U.S.S.R. brought about an overthrow of the present South African government, (as has been done next door in Moçambique), a U.S.S.R.—South African partnership would possess:

90 per cent of this planet's known reserves of Platinum
93 per cent of this planet's known reserves of Vanadium
82-94 per cent of this planet's known reserves of Manganese
71-86 per cent of this planet's known reserves of Chromium.

Also, a very high proportion of the world's in-ore reserves of GOLD.



"The Persian Gulf of minerals."

SOUTH AFRICA CLAIMS TO HAVE MORE MINERAL WEALTH PER SQUARE MILE THAN ANY OTHER COUNTRY ON EARTH. South Africa ranks among the first four mineral producers in the world, (oil and gas excluded).

Sources

Fortune, August 14, 1978;
I.P.M.I., April, 1978
Economist, July 9, 1977
E.I.U., August, 1978
South African Department of Mines
OECD; Royal Institute of International Affairs;
Economist Intelligence Unit

IMPORT DEPENDENCY OF THE INDUSTRIALISED WESTERN WORLD COUNTRIES ON SOUTH AFRICAN MINERAL SUPPLIES

PERCENTAGE OF EACH COUNTRY'S TOTAL MINERALS IMPORTS SUPPLIED DIRECTLY BY SOUTH AFRICA IN 1978

Commodity	United States	United Kingdom	West Germany	France	Italy	E.E.C.	Japan
Gold	—	66	5	16	59	56	—
Andalusite	90	65	15	—	32	n.a.	71
Group Minerals							
Antimony	6	90	15	7	—	10	—
Asbestos	4	18	12	8	49	12	34
Chrome Ore	48	79	66	24	23	50	52
Coal	49	1	19	37	16	n.a.	30
Copper	—	6	10	—	3	7	9
Diamonds	52	n.a.	26	3	7	n.a.	7
Ferrochrome	79	18	54	37	33	49	71
Ferromanganese	45	46	4	—	18	25	—
Fluorspar	23	—	12	—	—	7	27
Iron Ore		10	8	7	7	6	5
Manganese Ore	4	46	73	41	53	45	35
Manganese	31	74	52	54	73	78	—
Metal							
Nickel	4	—	17	14	23	7	18
Platinum	55	58	9	17	52	28	28
Group Metals							
Vanadium	87	—	6	20	—	25	90
Zinc	4	—	9	—	—	3	—
Zirconium	1	7	16	2	1	4	7

Source: South African Digest

5.14 SOVIET UNION

MINE OUTPUT OF GOLD

The U.S.S.R. is the second largest producer of newly mined gold in the world.

The R.S.F.S.R. produced about 80 per cent of Soviet gold in 1979.

Territories that are now in the Soviet Union, such as the Urals, the Caucasus, Kazakhstan and Central Asia, have produced gold from ancient times, (see the chapter on ancient gold sources). The historian Strabo claimed that Alexander the Great conquered Armenia in order to assure his large Empire of gold. The Romans minted coinage from Armenian gold mined at the Zod Pass, now in Soviet Armenia. Gold is once again produced there, after studies of the old workings in the 1950's.

The Altai mountains form part of the southern U.S.S.R. border. "Altai" (or Altyn) is an old Mongol word for gold and for money. Place names in other native languages in the predominantly Muslim areas of the Soviet Union reveal many that translate as "gold" or "golden".

There were ancient Russian gold mines at Pechora in the Ural Mountains. The gold mines at Berezov near Ekatherinburg, named after Catherine, (now called Sverdlovsk), East of the Urals, were discovered in 1743 and have yielded gold ever since.

About 60 per cent of current Soviet production is estimated to be from placer and 40 per cent from

1) reef mining, and

2) as a by-product of base metal mining, (estimated about 65 tons a year). (75 per cent comes from copper ores.)

Refined Russian gold is very pure, usually .9999 fineness, compared to South Africa's standard .996 fine gold.

The Soviet-owned Moscow Narodny Bank in London stated in 1973 that, in less than 10 years, Russia could outproduce South Africa in gold. It will not make it. However, gold ore reserves in the ground in the U.S.S.R. have certainly increased dramatically because of the much higher free gold prices since 1971. Being obliged to go to more expensive deep mining in the U.S.S.R. removes some of that advantage.

The last time Russia issued gold output figures was in 1935, forty-six years ago, when mine output of gold, largely from Siberia, was 150 metric tons a year and Soviet bullion reserves were only 745 tons.

A few years ago, the U.S. Central Intelligence Agency estimated Russian gold output at just over 100 tons a year at a time when the U.S. Bureau of Mines was suggesting that 370 tons a year was the likely figure. Others guessed it was 500 tons a year.

Soviet Gold Output, estimated

	1975	1976	1977	1978	1979
Gold-mine output, metal content (metric tons)	240	245	250	250	260

U.S.S.R. gold output in 1970 was estimated by Dowie and Kaser as 346 metric tons, (including 40 tons as a byproduct of base metal mining,) and 370 metric tons in 1973; 420 tons the 1974 figure, suggesting 440 tons in 1975. Consolidated Gold Fields estimated that Soviet gold output rose from 340 metric tons in 1970 to over 400 tons in 1975. THESE ESTIMATES ARE NOW CONSIDERED TO BE TOO HIGH. Soviet mine output of gold was about 255 or 260 metric tons in 1979, about the same as 1978. Perhaps two-thirds came from placers in the East.

1980 output may be between 200 and 260 tons. The U.S. Bureau of Mines estimated early in 1979 that Soviet output in 1980 would be 270 tons. Others say 250 tons a year is typical. There are some indications that Soviet mine production of gold is lower than in previous years. Consolidated Gold Fields say that it is 280 to 350 tons a year.

Publication of a detailed review of estimates of communist production of gold by the respected Consolidated Gold Fields is awaited with interest.

Equipment in Mines

Since 1979, a gold dredge has been in use on the Mamakan river near Bodaybo, which is 236 metres long, stands 40 metres above the water, has 170 buckets—each of 2 cubic metres capacity—and can dig to a depth of 50 metres. It must be one of the largest in the world.

Mine Labour Supply

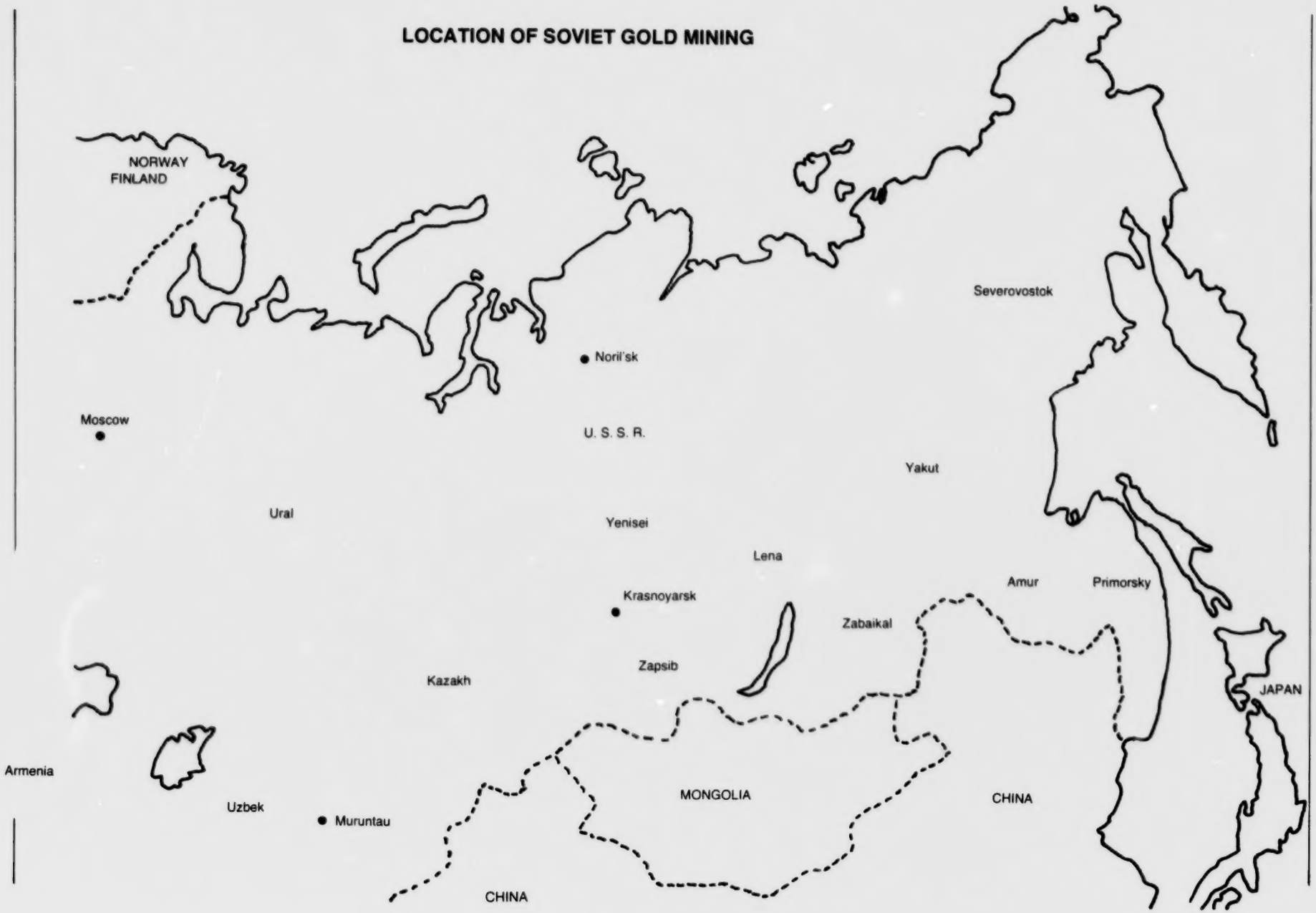
Nowadays, the Soviet government relies on a variety of incentives to attract workers to prospect for gold and to work the deposits.

In the Soviet Union, those who are employed in hazardous occupations such as mining receive longer, expense-free holidays than the 4 weeks of paid vacation a year provided in the Constitution.

In spite of this, it is becoming increasingly difficult to obtain workers for Soviet mines. Not even lucrative incentives attract workers, although miners are the elite of Soviet industrial workers, with average pay of 323 roubles (say U.S.$504) a month, plus production bonuses. Soviet publications discreetly indicate that the labour supply is starting to dry up at Soviet mines. The young show little interest in the backbreaking, hazardous work at some mines.

Mining operations are so desperate for manpower that visitors hear of one organization offering demobilized soldiers gifts of U.S.$1,550, as well as U.S.$7,750 to build a home, if the soldiers agree to become miners.

LOCATION OF SOVIET GOLD MINING



Gold mining in the U.S.S.R. takes place under dramatically contrasting climatic conditions—in the coldest inhabited regions on this planet and in the baking deserts of Kyzyl Kum and Ustyurt.

Aggravating the shortage of miners is an early-retirement policy that enables them to quit at age 50 on a monthly pension of U.S.$248—one third higher than the retirement pay received by workers in other fields.

Power Shortages

Mechanization of gold mining has been maximized accordingly. This requires more and more electrical power.

It has been shown in the U.S.A. that it requires four times as much energy to produce an ounce of gold from a placer deposit than from a lode deposit, which took under 500 kilowatt-hours per troy ounce produced, all fuels converted to electrical units.

In the major gold mining region of Magadan, a serious shortage of electricity in 1979—perhaps 1980 too—cost the Soviet Union a huge amount of revenue in lost output of gold, acknowledged in the Soviet Socialist Weekly. Only one 110 KV line, for example, runs from the Bilibino nuclear power station. (New machinery to extract the increasingly harder rock uses more electricity than older mining tools.)

A new hydroelectric dam with a 90-mile long reservoir on the Kolyma river, near Sinegorye, now under construction, will flood a number of gold placer mines forever. It will produce 900,000 KW.

SOVIET GOLD AGENCY

Glavzoloto is the chief administrative agency of the government for Soviet gold and platinum mining under the Ministry of Non-Ferrous Metallurgy. For each region, an association or trust called Zoloto reports to Glavzoloto. Zoloto means "gold" in Russian.

G *O L* *D*

Z *O L* O *T* O

A small part of Soviet gold output is produced by small private enterprises or teams called "Artels", which are separate from the State collectives.

All gold produced is flown promptly to Moscow.

The search for gold is being intensified in the Soviet Far East and Soviet Central Asia.

By-product Gold Output

Over 10 per cent of the Soviet Union's primary gold output may arise as a by-product of other (e.g. copper) mining; by-product gold from antimony mining may be won from the Sarylakh deposit, Yakutia, near the Arctic Circle.

Ocean Gold

Gold has also been extracted from ocean sands since the late 1960's and plans contemplate recoveries along the coast of the Sea of Okhotsk, South of the port of Magadan and in the Sea of Japan. The Arctic Ocean coast also has good prospects.

General

Gold accounted for an estimated 16 per cent of Soviet nonferrous metal production in 1975, but 20 per cent is probably aimed at in the future.

All indications are that Russian gold output will continue to increase year by year. Russia is committed to a continued expansion of gold output at a high priority level in state planning. This means that it gets new mining equipment. It also means an opportunity for Americans, Canadians and others to sell them machinery. The U.S.S.R. state enterprise for exploration has spread a wide net looking for reefs and placers.

Soviet Consumption of Gold

Domestic consumption of gold in Russia is estimated at between 90 and 100 tons a year.

Buying Gold inside the Soviet Union

A woman's gold wedding ring costing about U.S.$75 in New York City, U.S.A., was the equivalent of U.S.$225 in Moscow, Soviet Union. This difference however is greatly magnified when one considers the typical "hours worked per week, N.Y. City 39.7 hours; Moscow 42 hours", and "a manufacturing worker's earnings per week in N.Y. City U.S.$265.60; in Moscow U.S.$56.54" (equivalent at the official rate of exchange), or say five times less.—"The U.S.S.R.", Time, June 23, 1980.

n.b. The average wage for a 41 hour week at the Minsk, White Russia, specialized farm tractor factory was 205 roubles, (U.S.$308) per month, say U.S.$67 per week.

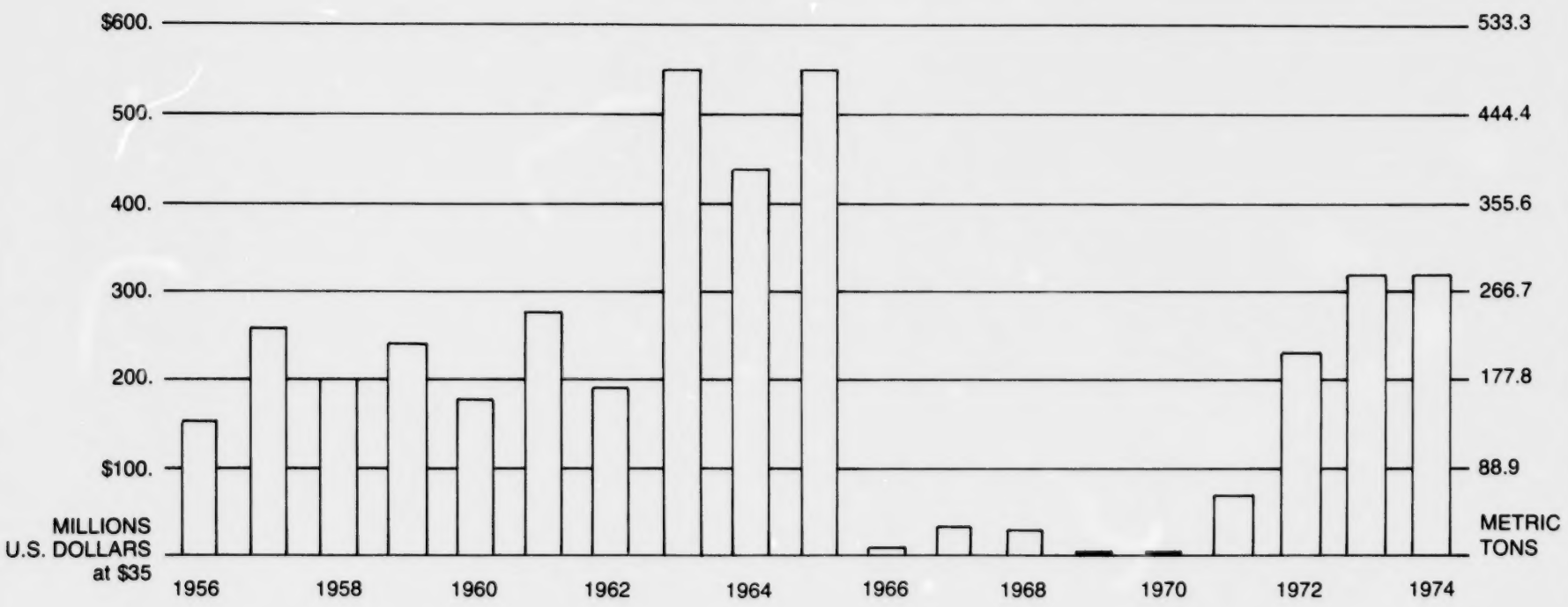
So in order to obtain a wedding ring in Moscow, Soviet Union, (the world's second largest mine producer of gold,) one needs to work about 15 times longer than in New York City, U.S.A. or perhaps 13 times longer than in Toronto, Ontario, Canada.

What this could mean is that when buying a gold wedding ring, the Soviet domestic consumer of gold is apparently obliged to pay 13 to 15 times the international free price of gold, compared to a U.S. (New York) consumer of gold.

SOVIET SALES OF GOLD TO THE WEST

The Soviet Union sells a not precisely known part of its precious metal production on the free market in the West, but it is estimated that most of this output is exported.

GOLD: ESTIMATED SALES BY U.S.S.R.



Soviet gold exports are vital to the economy since it is still essentially that of a semi-developed country.

The only Soviet materials which are sold abroad quite easily are *gold*, iron ore, oil and natural gas—apart from vodka. The U.S.S.R. also has nickel, diamonds, palladium, platinum etc., but cannot always sell them.

The Soviet Union could make use of its gold bullion reserves to compete with buyers in the Western world on the already strained world oil market, which would push energy prices higher and cause untold economic upheaval.

Gold and petroleum have been the Soviet Union's stock in trade—accepted everywhere in the world at going prices.

The value of Soviet metal and oil exports has, of course, greatly increased per ounce and per barrel in recent years. The Russians have generally preferred to accumulate gold, but this policy may be in the process of changing.

IT IS ESTIMATED THAT THE SOVIET UNION MUST BECOME A NET IMPORTER OF OIL BY THE EARLY 1980'S OR A LITTLE LATER AND THEREFORE THE PRESSURE TO SELL MORE BASE AND PRECIOUS METALS TO OBTAIN VITAL HARD CURRENCY FOR THE U.S.S.R. WILL PRESUMABLY INCREASE. The Soviet Union may yet attempt to capture and control the Persian Gulf oilfields.

The Soviet Union remains the world's largest oil producer, about 12 million barrels a day in 1979, but existing fields are near or past their peaks and the fact that there have been no major new discoveries since the early 1970's means that none are now coming on stream.

It takes five natural gas pipelines to move as much energy as one oil pipeline and the U.S.S.R. is not over-endowed with pipelines. However, the Soviet Union probably achieved its output and delivery target of over 400 billion cubic metres of natural gas in 1980, since gas reserves are ample.

The U.S. International Trade Commission has kept a record of Soviet sales of gold since January, 1978, and the "facts" can be obtained freely—although several months behind.

Forecasts of Soviet gold exports are generally based on the assumption that the Soviet Union will attempt to dispose of virtually all of the precious metals arising as a product of its vigorous and high priority mining program at some price or other, no matter what the mining/refining cost, leaving South Africa to supply most of the balance of world demand, whether high or low. AT THE CURRENT HIGH PRICE LEVEL, THE SOVIET UNION NEEDS TO SELL LESS GOLD METAL TO ACHIEVE THE DESIRED EFFECT ON THEIR BALANCE OF PAYMENTS.

Even the U.S. C.I.A. estimated in 1977 that the U.S.S.R. will depend on such metals as gold and the platinum group metals, which are byproducts of nickel mining, to boost its earnings of hard currency to compensate for expected lower oil exports in the future.

However, the Soviet Union reduced their sales of platinum late in 1977 and this continued through 1978. Sales of gold to the West were almost nil in the first 8 months of 1980.

Actually, there is little evidence of Soviet sales of gold abroad between 1966 and 1971, either.

In recent years, Western nations have been only too willing, even eager, to grant loans and credits to the Soviet Union, to finance badly needed modern equipment and turnkey plants.

The Soviet Union owes to the West foreign debt totalling an estimated U.S.$50 billion at the close of 1980.

These generous loans give Russia the greatly improved option of building up a much larger powerful reserve of gold bullion, less of which needs to be exported to pay for essentials.

This also carried the attraction of providing a base for a rouble that could become soundly convertible and thus greatly increase the prestige of the Soviet Union in the world.

With such a gold reserve, Soviet repudiation of the pile of foreign debt becomes an option and such action would, of course, greatly damage certain Western countries.

The Soviet Union has a sales policy for gold which understandably serves its own purposes and not world users of the metal. In times of reasonable demand it elects to sell or withhold metal while being quite unable, of course, to control the ebb and flow of industrial demand itself in the West.

Russia has usually sold her bullion gold through the Soviet-owned Wozchod Handelsbank, A.G., Zurich, Switzerland, or on occasion the Bank for International Settlements at Basel, Switzerland. Record sales of some 500 tons or more of gold in 1965 bought about $600 million worth of grain, but a smaller quantity (280 tons) sold to the West in 1973 may have bought the Soviet Union $1.2 billion worth of grain.

The Soviet-owned Wozchod Handelsbank in Zurich, opened in 1966, had assets of U.S.$488 million in 1979 and was the 16th largest foreign bank in Switzerland, ahead of Chase Manhattan and Chemical Bank.

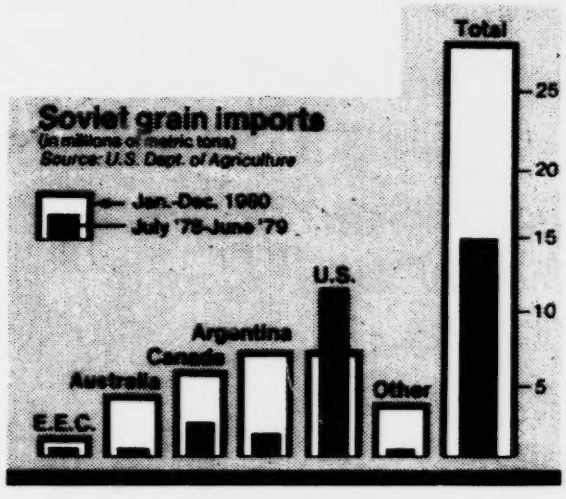
Wozchod means "rising sun" in Russian. Aurum "shining dawn," is the Latin word for gold.

The fact that the Soviet Union has shipped gold at any time to Zurich does not of course mean that the Russians have actually sold it.

Much of the gold in Zurich banks vaults—not just Soviet gold—is in any case in transit for tax reasons and is held duty free and never appears in Swiss Customs figures.

The Soviets are rumoured to have shipped gold direct to certain Near East purchasers, avoiding Switzerland, as well as direct to West Germany, U.K. and the U.S. The U.S.S.R.

Most of the USSR's vast agricultural land base lies latitudinally north of the United States
Fairbanks
Arctic Circle
Ontario
Toronto
Minneapolis
Philadelphia
Washington
San Francisco
Denver
Springfield
Soviet agricultural lands


Soviet grain imports
(in millions of metric tons)
Source: U.S. Dept. of Agriculture
Jan.-Dec. 1980
July '78-June '79
Total
25
20
15
10
5
U.S.
Argentina
Canada
Australia
E.E.C.
Other

shipped 2.9 metric tons of gold into the U.S.A. in September, 1980. Prior to that, only a few kilos of Soviet gold, in doré, came to the U.S. during the year. (For doré, see Glossary.)

The Grain Harvest Effect on the World Gold Price and Meat Shortages

The world price of gold is frequently directly linked to the weather in the Ukraine, U.S.S.R., because when the Soviet grain crop falls well below their target requirements, as in 1980 etc., the Russians have usually sold gold, platinum etc. to the West to provide hard currency with which to obtain necessary supplies of grain from the U.S., Canada and Australia.

Four of the six harvests, 1973 through 1977, yielded less grain than the Soviet Union consumes, forcing large imports from the U.S.A., Canada, Australia and Argentina which have to be bought with hard currency obtained by selling gold, platinum, nickel etc. In the twelve months, October 1, 1977 through September 30, 1978, the U.S.S.R. imported 20 million metric tons of grain at a cost of well over U.S.$2 billion, mostly from the U.S.A.

After 1975, Russia had to reduce the size of its bread loaf. This was necessary again in 1978. Coarse grains, (feed grains), are mainly fed to animals. If the Soviet Union does not import sizeable quantities of feed grains after those bad harvests, they would have to slaughter a large part of their herds of cattle, hogs, poultry etc. They did this in earlier years. For internal political reasons, the Soviet government is more than ever reluctant to do this.

Domestic demand for meat has risen inexorably in the U.S.S.R. Officially, the per capita consumption of meat in the U.S.S.R. now stands at 57 kg.-58 kg. but, in reality, probably only 40 kg., half the figure in Poland before the summer 1980 disturbances. The new state goal is 63 kg., to include offal and byproducts, but Soviet nutritionists have been advocating for some time 75 kg. of meat as the "physiologically indispensable" per capita minimum. (A North American consumes about twice as much meat as the average Soviet citizen.) Substantial imports of grain into the U.S.S.R. appear inevitable through 1985.

Soviet meat production in 1980 was down substantially. IT SHOULD BE KEPT IN MIND THAT THE 1980 TROUBLES IN POLAND BEGAN WITH MEAT SHORTAGES.

The monitoring of Soviet crop conditions is done by the U.S. Earth Resources Technology Satellite (ERTS), now called LANDSAT, launched in 1972 and 1976.

McDonnell Douglas Astronautics Co., the Laboratory for the Application of Remote Sensing (LARS) and Purdue University are able to further process the satellite data and make monthly status estimates of eventual crop size in the Ukraine, the North China plain, India, Argentina and Australia. It is accepted that Soviet agricultural officials admit that U.S. information on the Russian farm outlook is better than that available to the Kremlin. When reliably interpreted, such estimates have usually been extremely useful to traders in markets in the West for gold, platinum etc. In the fall of a year when the harvest is bad, the Soviet Union often sells much more gold in order to purchase grain.

The Soviet need for grain from the West is assumed by observers to have *first claim* on available hard currency for essential imports, depending on whether harvests are good or poor. Grain imports by the Soviet Union have been varying between $1.5 billion and $3 billion a year.

In 1978, the U.S.S.R. had a record 237 million metric tons grain harvest. Although the 1979 target was 227 million metric tons, it was not reached. The U.S. Agriculture Department estimated it was 170 to 180 million metric tons.

Soviet import requirements roughly doubled during the year 1979-80—from 5 million metric tons of wheat and 10 million tons of coarse grains to 7 to 11 million metric tons of wheat and 13 to 19 million metric tons. The last U.S. C.I.A. forecast estimated Soviet imports as 35 million metric tons. Understandably, grain prices in Chicago's commodity futures markets rose on the news, which was bearish for the gold price.

An extra U.S.$1.25 per bushel on the U.S. wheat crop, plus say 60 cents on corn (maize) is worth about U.S.$6.5 billion a year to U.S. farmers and perhaps U.S.$2.5 billion in export earnings. The Chicago July 1979 wheat contract peaked on June 22, 1979 at U.S.$4.83 a bushel. At around U.S.$5.00 a bushel, U.S. wheat would only just about reach European Economic Community (E.E.C.) support levels at present rates of exchange.

The U.S. Department of Agriculture's June 8 forecast of the rain-delayed, May/June drought-affected Soviet grain crop for 1979 of only 179 million tons, (down from 1978), caused Western metal traders to expect the U.S.S.R. to export more gold, platinum etc. to pay for increased Soviet imports of grain from the West. (The C.I.A. estimated 185 million tons.)

The Soviet Voprosy Ekonimiki (Problems of Economics) journal states that the U.S.S.R. loses as much as 35 to 40 million tons of its grain harvest through inadequate drying procedures, transport failures, storage problems and theft.

Rot, mildew and inefficient handling and storage meant that the 1979 crop of 179 million tons provided only about 150 million tons that was usable as food. I. N. Buzdalov of the Soviet Institute of Economics at the Academy of Sciences said the waste was caused because profitability, efficiency and quality play virtually no role in the work of State and collective farms.

The grain ceiling embargo imposed by President Carter following the Soviet invasion of Afghanistan in December, 1979, continued until President Reagon cancelled it in April, 1981. Canada paralleled the ceiling embargo for a time.

Swiss bankers calculate that the Soviets had to sell about U.S.$500 million in 1980, primarily to pay for grains that

the Soviets would have to import from other countries, (grains that were imported at a much higher price than was obtainable without the embargo).

By mid-October, 1980, it became known that the Soviet Union had had *another* disastrously low grain crop at 181 million tons. This was confirmed by the Soviet government on October 22, i.e. the year's shortfall was some 54 million tons, against an output target of 235 million tons. Only about 154 million tons of the crop will be usable as food, for reasons given above.

The failure, yet again, of the Soviet grain crop was a considerable blow to the Soviet Union. Once again, it showed that the Soviet Union cannot feed its people and its animals without huge grain imports.

The U.S.S.R. began selling gold again in September, 1980 to raise dollars and other hard currencies to finance new grain imports from Australia and Argentina on a large scale.

It was therefore expected to import 30 million metric tons of grain from Canada, U.S. etc. during the 1980-81 winter period. The Soviet people is never told about these grain imports. The Ukraine port of Odessa handles most of this, under tight security conditions. Countries that bought grain in the fall of 1980 had to pay 20 to 30 per cent more than in 1979.

Even with this supply, Soviet internal supplies of grain-fed meat will almost certainly not increase in the 1980-81 period. Some Western experts estimate that the U.S.S.R. will have to import 20 to 25 million tons of grain to maintain their herds at present strength.

The Soviet grain harvest this summer and fall might rise 11 per cent above the disastrous 1980 level, to 210 million tons, according to the U.S. Department of Agriculture.

Another Soviet crop failure in 1981 could mean really severe domestic grain shortages, with an even greater sell-off of Soviet gold to the West. It is estimated that by June, 1981, when the wheat harvest in the North begins, the world's reserves of grains will be the lowest since mid-1975.

Since the Soviet Union usually has to export gold, platinum etc. to pay for vital grain imports, it is worth noting that every time there is a large sale to the U.S.S.R. of feed grains from Saskatchewan, Alberta and Manitoba in Canada, a side effect is that the gold price received by Ontario's mine producers of gold is usually lowered to some degree a short while afterwards.

Soviet Gold Sales—1980, 1979, 1978 and 1977

The Soviet Union did itself one good turn by invading Afghanistan late in 1979 because the invasion news was the main drive behind the January 1980 gold price surge to U.S.$850 an ounce. The fighting between Iraq and Iran in September, 1980, pushed the price up to $700 again but it fell back to the 500's and 600's for the rest of the year.

As the world price for gold increases, Soviet sales of gold decrease. The Soviet Union, apparently *in 1980 no longer needed to sell all its mine production of gold for balance of payments reasons*, partly because in 1980 each ounce of gold exported brought them in over three times as much hard currency compared to what it did in 1978. The Russians have the discipline to wait for even higher prices. The U.S.S.R. may have had to sell about one billion dollars of gold to provide temporary help to prevent Poland's economy from collapsing totally. Curiously, 3 tons were imported into the Soviet Union in April, 1980. Probably, the 1980 visible export total was 80 tons. The Soviet Union will probably have to discipline Poland. Otherwise, East Germany, Czechoslovakia etc. might want a corresponding raise in living standards, freedoms and provisions.

Soviet sales of gold in 1979 slipped to only 230 metric tons from 410 tons in 1978. Russian gold sales in 1978 were 450 tons in other estimates. The Soviet Union ran an estimated merchandise trade deficit with the West of U.S.$3.5 billion in 1978. However, its gold coin and bullion sales totalled $3 billion. Soviet gold sales in 1978 were probably about 340 tons, according to the U.S. C.I.A.

1977 Soviet gold sales covered much more than *half* of their hard currency trading deficit. In 1977, the Communist countries had sold more than 400 metric tons of gold bullion for about U.S.$2 billion, i.e. about one quarter of total world gold sales of 1,607 metric tons.

Total U.S. imports of all kinds from the Soviet Union in 1977 amounted to only $219 million. Metals and minerals worth over $100 million dominated these imports from the U.S.S.R., comprising almost half of the total imported.

The U.S.S.R. always prefers a *high* gold price, since it represents one of their few reliable methods of obtaining badly needed hard currency. The increase in the amount of hard currencies earned by the U.S.S.R. because of higher metal prices enables the Soviet Union to buy the special mining machinery they badly need in the placer gold mining operations in the coldest inhabited zone in the world, the Soviet Far East, in order to increase gold production.

Much of the new equipment is American. Of course, because of continuing inflation in the West, the advantage of the higher dollar earnings is partly lost, in that the Russians now have to pay much higher dollar prices for each machine and piece of equipment, compared to say 1972.

A lot depends on Soviet industrial, defence and automotive demand for gold and the requirements for the special Soviet gold coins and medals commemorating the 1980 Summer Olympics in Moscow and Tallinn, Esthonia and other events.

Russia has tended to stockpile as much of its gold output as possible, keeping exports down to a minimum, and to release gold on Western markets only in emergency situations, (such as years with a poor grain harvest), for the purchase of essential feed grains, sugar, machinery, etc.

The U.S.S.R. had built up a foreign debt of U.S.$17 billion by mid-1979. By 1980, repayments on past debt should have exceeded new drawings. Total Soviet purchases of U.S. food products alone, (mainly feed grains), exceeded a record $2 billion in 1979.

Such grain purchases by the U.S.S.R. are no longer a decision for the U.S.D.A. alone. Since grain is indeed a "strategic" resource, U.S. national security officials will almost certainly have the final decision in such matters from now on. The value of Soviet trade with the West rose from U.S.$17.2 billion in the first half of 1979 to $22.8 billion in the same period of 1980.

U.S.D.A. analysts forecast a drawdown in world grain stocks of 50 million tons or more during 1980.

ALL OF THIS ACTIVITY HELPS TO KEEP THE GOLD PRICE HIGH.

RESERVES OF REFINED GOLD—U.S.S.R.

Reserves of Gold Bars in Store

RUSSIA'S MORE THAN ADEQUATE MONETARY RESERVES OF REFINED GOLD, A CLOSELY GUARDED SECRET, MAY BE IN THE AREA OF 2,000 METRIC TONS, according to the U.S. Bureau of Mines.

One French banker in Moscow estimated in 1979 that the Soviet Union has 3,000 tons of gold in its vaults worth $30 billion. The U.S. C.I.A. estimates the stockpile as only 1,870 metric tons.

The C.I.A. calculated that Soviet gold bullion reserves were 1,850 metric tons at the end of 1973, a drop of 100 tons in one year. Some Swiss experts put them at 1,800 tons. Two thousand, seven hundred (2,700) metric tons was the estimate of the respected Michael Kaser of Oxford University. British Bankers Samuel Montagu once estimated Soviet reserves at 8,000 tons. Others say 4,000 to 5,000 tons. (The Russians confiscated Spain's gold reserves, 500 metric tons, in 1936; they were taken to Moscow during the Spanish Civil War and have never been seen since.)

The State Bank (Gosbank) of the U.S.S.R. buys gold from the Ministry of Non-ferrous Metallurgy. The State Bank would presumably like the gold bullion reserve to be higher. It is believed by some that no allocation to the gold reserve was made during 1973 and that the reserve remained unaltered in 1974. Soviet policy appears to be the building up of a formidable gold stock whenever possible.

Soviet gold bars are of the highest purity. Russian refineries have raised the purity of the bars to .9999, or 999.9/1000ths. gold, compared to South African bars which are typically 996./1000ths. gold.

Private Fortune in Russian Gold

In 1891, the Grand Duke Michael of Russia contracted a morganatic marriage with Sophie Meremberg, Countess de Torby, a granddaughter of Russia's greatest poet, Alexander Pushkin.

He sought Tsar Alexander III's approval of the marriage for three years. In 1894, supported by Edward, Prince of Wales, he renewed his efforts with the new Tsar, Nicholas II, aged 26. However, the new Tsar also withheld his approval and consequently Grand Duke Michael decided to leave Russia and establish residence in England. He therefore forfeited everything except his private fortune. He removed this from Russia in his private train IN BAGS OF GOLD. The Bank of England described the Grand Duke Michael's deposit of gold as THE LARGEST EVER RECEIVED by the bank FROM A PRIVATE INDIVIDUAL.

Grand Duke Michael and Sophie had a daughter, called "Nada" in England. Nada, who was understandably very wealthy, married the elder brother of Lord Louis Mountbatten, George, the second Marquess (which some Americans mistakenly call Marquis) of Milford Haven and she became the Marchioness. George was not wealthy.

Why is an heiress of a Russian fortune in gold of interest nowadays? Well, the Princess Alice (Mountbatten), sister of George and Louis, married Prince Andrew of Greece. Prince Philip was her only son.

The Princess Alice and her five children were living in straitened circumstances in exile in Paris after distressing upheavals in Greece and it was Nada and George who persuaded her in 1929 to send her eight year old son, Prince Philip, to Britain to be educated and it was soon decided that Nada and George should take him in. They assumed complete financial responsibility for his education.

Prince Philip married the Princess Elizabeth, Queen of England since 1952. Her Majesty Queen Elizabeth II is also Queen of Canada.

SOVIET UNION—PRECIOUS METALS PRODUCTION (estimated)

	Metal Recovered from Mine Output Annual	Soviet Sales to the West Yearly
GOLD Soviet mine output, (mainly from placer mining). Cost of production was estimated at $75-85 an ounce, as at 1975. Several gold mines suffer from a serious lack of ore reserves, particularly the placer operations.	260 metric tons in 1979 250 metric tons in 1978 250 metric tons in 1977 245 metric tons in 1976 240 metric tons in 1975 235 metric tons in 1974 230 metric tons in 1973 230 metric tons in 1972 Soviet reserves of refined gold bullion in vaults are estimated to amount to 2,000 metric tons. (Michael Kaser Oxford University, estimated them as 2,700 metric tons.) In November, 1978, J. Aron Precious Metals Research Department's estimate was about 2,800 tons.	230 metric tons in 1979 410 metric tons in 1978 400 metric tons in 1977 342 metric tons in 1976 160 metric tons in 1975 150 metric tons in 1974 330 metric tons in 1973 (highest since 1965). 200-250 metric tons each year, 1971 and 1972. Soviet gold sales are made through their two trade banks, (Wozchod Handelsbank, A.G., Zurich, Switzerland, and the Moscow Narodny Bank, London, England); or through the Bank of International Settlements at Basel, Switzerland.
SILVER—mine output	1,350 metric tons in 1974, 2.4 per cent above 1973.	Very little sold to the West in 1971, 1972, 1973 or 1974.
PLATINUM	25.0 metric tons The U.S.S.R. is believed to have a large stockpile of unsold refined palladium metal, estimated to be 50 tons or more and perhaps 20 tons of platinum.	22.5 metric tons in 1976 22. metric tons in 1975 22. metric tons in 1974
PALLADIUM	60.0 metric tons	34.2 metric tons in 1975 30.0 metric tons until 1975 (could average 37 tons p.a. in the next 5 years).
RUTHENIUM	about 5.0 metric tons	not known
RHODIUM	1.4 to 2.0 metric tons range	not known, but some is exported
IRIDIUM	0.3 to 1.5 metric tons range	not known. May be no exports.
OSMIUM	n.a.	not known.
TOTAL P.G.M.'s	88.0 metric tons in 1977 82.0 metric tons in 1975 78.0 metric tons, 1974 76.02 metric tons, 1973 74.6 metric tons, 1972 The *target* for *1978* mine output is believed to be about 95 metric tons P.G.M.'s, and in 1980 105 metric tons.	Total sales of P.G.M.'s (In 1972, 28.34 metric tons of Russian P.G.M.'s went to Japan; 12.66 tons to U.S.A.; 7.02 tons to West Germany; 1.57 tons to France; 1.05 tons to U.K.; 0.45 tons to Holland.)
DIAMONDS (gem and industrial)	1977 Output: 8.2 million carats of industrial quality and 2.1 million carats gem quality, estimated.	$420 million sold in 1973 $200 million sold in 1972 Soviet sales of diamonds to the West amounted to U.S.$500 million in 1977.

In December, 1980, increased supplies of investment-grade diamonds from the Soviet Union, falling prices caused by very high interest rates and the general economic slowdown caused DeBeers of South Africa to sell far fewer diamonds than normal and to stockpile current output. The Soviet Union was offering discounts to dealers amounting to as much as 15 per cent for gems in their apparent effort to obtain hard currencies needed to help pay for Western grain and the Afghan operations. Nevertheless, the December price for a 1-carat "D-flawless" stone was U.S.$54,000, almost 500 per cent higher than late 1977. Rubies doubled in price in 1980, sapphires were up 50 per cent and opals up 25 per cent.

VALUES—End of 1974, (a boom year), metal prices in the West were approximately:

Gold (London Bullion Market)	U.S.$5.8 million per metric ton
Silver (Handy & Harman)	U.S.$0.14 million per metric ton
Platinum	U.S.$6.24 million per metric ton
Rhodium	U.S.$11.36 million per metric ton
	(free market $16.0 million per metric ton)
Iridium	U.S.$16.2 million per metric ton
	(free market $18.4 million per metric ton)
Osmium	U.S.$6.4 million per metric ton
Palladium	U.S.$4.8 million per metric ton
Ruthenium	U.S.$2.0 million per metric ton
In 1980, Gold had gone as high as	U.S.$22.50 million per metric ton
and Silver had touched the	U.S.$1.30 million per metric ton level.

The U.S.S.R. is the world's leading mine producer of the precious metal palladium, iron ore, manganese, chromium and lead.

Sources: U.S. Bureau of Mines; Chairman, Impala; S. Montagu; Mining Annual Review.

5.15 U.S.A.

	1974	1975	1976	1977	1978	1979	1980
Gold output (metric tons)	35.1	32.4	32.2	32.0	30.2	30.15	29.0

Mine production of gold in the U.S.A. in 1980 was down 4 per cent to an estimated 29 metric tons valued at U.S.$570 million. 1980 imports of gold were 155 metric tons of gold, of which 41 per cent came from Canada. Gold coin imports were 93 metric tons—half in Krugerrands. 1980 exports were 233 metric tons, mainly to Canada. U.S. consumption of gold declined to 93 metric tons in 1980, down from 140 tons in 1979. Mine production in 1977 was only 32 metric tons of gold. In 1978, 25 mines in the U.S. yielded 95 per cent of domestic mine output of gold. 3 of these accounted for 65 per cent.

A sizeable share of U.S. mine production is byproduct gold output from non-ferrous operations, probably over 35 per cent. Total U.S. mine output of gold is equivalent to only about 20 per cent of U.S. consumption in the arts and industry. Some of the balance is imported from Ontario etc. Secondary recovery of gold (from scrap etc.) was over 80 metric tons in 1977.

The major producers are: Homestake, (lode), Kennecott, Carlin, (Newmont group), (lode), Asarco, Phelps Dodge and Cortez, Nevada.

U.S. mine output of gold should double in the next few years.

U.S. Gold Policy Commission

A joint U.S. Congress/Administration study of national gold policy is due to be submitted in October, 1981. It will investigate the role of gold in the domestic as well as the international monetary systems and make recommendations to Congress by then.

Homestake

Largest gold mine in the U.S.A. The Homestake mine is located at Lead, (pronounced Leed), in the Black Hills of South Dakota and it is the largest gold mine in the non-communist world—outside of South Africa. Homestake planned to produce over 10 metric tons of gold in 1980 at Lead, SD. 1979 output: 8 metric tons of gold. Production cost $250 per ounce gold.

Down the gulch from Lead is the town of Deadwood. Some fifty miles to the south is Mt. Rushmore, with its famous faces of the Presidents carved in stone. This is the locale of Calamity Jane. After 100 years, Homestake continues to produce gold in about a 6 to 1 ratio by weight with associated silver.

Mine	Location	Mining Method	Size of Operation	Product
UNITED STATES				
Alligator Ridge	Nevada	P	C	Au
Atlanta	Nevada	P	E	Au
Battle Mountain	Nevada	P	C	Au, Ag, Cu
Black Hills	South Dakota	U	B	Au
Carlin	Nevada	P	C	Au
Cortez	Nevada	P	B	Au
Ortiz	New Mexico	P	C	Au
Round Mountain	Nevada	P	B	Au
Windfall	Nevada	P	E	Au
Buckhorn	Nevada	P	E	Ag, Au
Candelaria	Nevada	P	B	Ag, Au
Delamar	Idaho	P	D	Ag, Au
Ajo	Arizona	P	A	Cu, Au, Ag
Continental	New Mexico	P/U	B	Cu, Au, Ag, Zn
Morenci	Arizona	P	A	Cu, Au, Ag
San Manuel	Arizona	U	A	Cu, Mo, Au, Ag, Re
Superior	Arizona	U	B	Cu, Au, Ag
Utah Copper	Utah	P	A	Cu, Mo, Au, Ag, Re
Idarado	Colorado	U*	D	Zn, Pb, Cu, Au, Ag
Leadville	Colarado	U	E	Zn, Pb, Au, Ag
Resurrection	Colorado	U	E	Zn, Pb, Au, Ag

LEGEND

A — plus 3 million tonne/year
B — 1 million to 3 million tonne/year
C — 500,000 to 1 million tonne/year
D — 300,000 to 500,000 tonne/year
E — 150,000 to 300,000 tonne/year

U — underground
P — open pit
* — operation suspended

S — solution mines
AV — alluvial/beachsand mines
R — discrete tailings retreatment units

New U.S. Developments

In 1980, Homestake reported the discovery of gold at Lower Lake, Napa Valley, in Southern California. An open pit, (grading 0.173 ounce per ton, estimated production cost $200 per ounce), and processing plant costing U.S.$100 million will commence gold output in 1984. It will be the country's fourth largest gold mine, producing at least 3 metric tons of gold a year for 10 years through 1994. The strike contains about 100 metric tons of gold.

Continental Mineral Inc. of Las Vegas plan to begin excavation of what may become "the wealthiest gold mine in the history of the States," at Sugar Loaf mountain, 8 miles SW of Medford, OR.

Placer Amex, the U.S. subsidiary of Canada's Placer Development, (associated with Noranda), is resuming heap leaching at the Cortez mine in Nevada.

The present Carlin open pit mine (Newmont) produced 4.3 metric tons of gold in 1979, (ore grade 0.186 ounce of gold, cost over $200 per ounce) and is constructing a new pit to bring in an additional 2.3 million tons of ore and another 3.1 million tons of lower grade ore for heap leaching. Reserves about 37 metric tons of gold contained. Pre-tax costs over U.S.$130 per ounce.

Newmont revealed in April, 1981 that an orebody containing about 150 metric tons of gold has been indicated at its "Gold Quarry" prospects 14 miles south of Carlin, Nevada. Operating costs should be lower than past years at Carlin.

Amselco gold mine—joint venture of a unit of Occidental Petroleum and U.K. controlled American Selco—is 60 miles from Ely, Nevada. Production will be over 3 metric tons of gold a year by 1983-84.

Placer Services (St. Joe Minerals) is working on two sites which together should produce about 2 metric tons of gold a year.

St. Joe also hopes to begin mining at its San Juan, California, project by late 1983 at about 1.5 metric tons of gold per annum. (The U.S. Geological Survey believes that this property is the largest undeveloped reserve of placer gold in the U.S.A.). An open pit mine may start up in 1983 at the Mother Lode Gold Mines find near Copperopolis, California, said to contain about 16 metric tons of gold.

Texasgulf is developing a small gold-copper property in eastern Oregon. At the Cripple Creek gold prospect in Colorado, work is proceeding on the reactivation of the existing mill, with production planned to begin in 1982.

The first gold pour at the Pinson gold mine, Humbolt County, Nevada took place in February, 1981. Annual gold output should be 1.4 metric tons of gold a month. 1,000 tpd open pit, grade 0.152 ounce gold per ton. Break-even cost: $285 per ounce gold.

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
Lacana/Raycock	Humboldt Co., Nevada	910 tonne/ day Au	1981	$12M	P/Cn	Pinson property
St. Joe/Yuba Goldfields (Placer Service Corp.)	Marysville, California	50,000 oz/ Year Au	1982	$11.4M	A	Resuming dredging 50,000 oz/year by end '82 when 2nd dredge operational
Copper Flat Partners	Sierra Co., NM	13,500 tonne/day Cu, Mo ore with Ag, Au values	1982	$98M	P/Cn	Quintana Minerals to operate new mine; Phibro to market concentrates
American Pyramid Resources	Ball Mt., Nevada	450 tonne/ day Au		$2.5M	U/Cn	Development finance sought
Amselco/Occidental Minerals	Alligator Ridge, Nevada	680,000 tonne/year Au	1981		P	Working up to rated capacity. Heap leaching
Carlin Gold	Carlin, Nevada	360,000 tonne/year Au	1981			Developing Maggie Creek and evaluating Gold Quarry properties
Newmont Mining	Maggie Creek, NV, US, 14 miles south of Carlin	79M ozpy Au	1981	$10MM		
Freeport Minerals/FMC	Elko, NV, US	200M ozpy Au	1981	$115MM	A	Jerritt Canyon project
Homestake Mining	Napa City, CA, US	OP 100M ozpy Au	1984		AB	Ore reserves: 100 metric tons of gold contained.
Miller Mining	Angels Camp, CA,US	UG 200M ozpy Au	1981	A		$3MM spent for environmental controls
Newpark/Noranda	Park City, UT, US	UG 120M stpy Ore	1983		B	Reopening Mayflower mine
Noranda Mining	Happy Camp, CA, US	OP/co	1983	$25MM	B	Gray Eagle orebody leased from Siskon Corporation
Randers Exploration	Cooke City, MT, US	OP/co	1982		BC	Design studies in progress.

Mine Production Of Gold In The United States

	Troy Ounces				
	1974	1975	1976	1977	1978
Alaska	9,146	14,980	22,887	18,962	13,555
Arizona	90,586	85,790	102,062	90,167	93,021
California	5,049	9,606	10,392	5,704	4,259
Colorado	52,083	55,483	50,764	72,668	31,071
Idaho	2,898	2,529	2,755	12,894	20,344
Montana	28,268	17,259	24,075	22,348	19,469
Nevada	298,754	332,814	287,962	324,003	237,889
New Mexico	15,427	15,049	15,198	13,560	9,921
South Dakota	343,723	304,935	318,511	304,846	285,512
Utah	254,909	189,620	187,318	210,501	234,604
Other States	26,043	24,187	26,113	24,694	15,439
TOTAL	1,126,886	1,052,252	1,048,037	1,100,347	965,084

Source: U.S. Bureau of Mines.

Mine Production Of Gold In The United States By Sources

	Troy Ounces			
	1974	1975	1976	1977
Placers	12,370	20,243	27,623	23,214
Dry and Siliceous Ores	649,869	649,693	644,902	656,369
Copper Ores	410,848	325,576	325,741	345,734
Lead and Zinc Ores	1,930	1,833	1,727	1,802
Other Ores	51,109	53,994	47,714	72,858
Other Materials	760	913	330	370
TOTAL	1,126,886	1,052,252	1,048,037	1,100,347

Source: U.S. Bureau of Mines.

The other important mine producer countries of gold are:

5.16 BRAZIL

Increasingly effective Jesuit protection of Indians in Brazil by 1693 made slave-dealing unprofitable, so colonists began an intensive and successful new search for gold. More white settlers flocked to Brazil in the gold rush of 1695; diamonds in 1725, the world's chief source of supply until the South African discoveries of 1867 and later.

In the 18th Century, Brazil was the world's largest producer of gold. Brazil output of gold, 1691-1780: 746 metric tons estimated, (292 tons in 1741-60). Much of this gold gravitated to London.

Current mine output: 1980, 26 metric tons of gold, estimated. Registered production of gold exceeded 15 tons in 1980, according to the Ministry of Mines and Energy, adding that 1979 output was 7 tons. The amount of illegal gold not registered is not known. About 60,000 "garimpeiros" (prospectors) had been smuggling their gold abroad or shipping it to "underground" refineries in Sao Paulo. In 1980, the government stepped in, establishing more law and order. About 60 per cent of Brazil's gold use requirements have had to be imported.

Consolidated Gold Fields say that Brazil overtook the U.S.A. as the world's third largest non-communist mine producer of gold in 1980, with an output of 40 metric tons of gold, ranking after South Africa; 675 tons, and Canada, about 50 tons.

Consolidated Gold Fields feel that Brazil could produce 100 metric tons of gold a year by 1990. At the current rate, it hopes to overtake Canada by 1982. Financing is the major problem, however, because two-thirds of the estimated reserves lie in non-alluvial deposits.

Brazil ended 1980 an estimated U.S.$58 billion in debt to foreign institutions. Brazil—population 120 million—will vigorously pursue gold mining in the years ahead to help improve its credit rating.

One recent placer discovery, for example, will soon be producing at a rate of some 12 tons of gold a year. Some lucky garimpeiros have discovered gold nuggets weighing up to 15 pounds, say 210 troy ounces, each, (worth over U.S.$110,000), at Serra Pelada, 70 kilometres from Maraba in Northeast Brazil. The Serra Pelada alluvial mine may have produced just under 10 metric tons of gold during 1980. This mine may become one of the world's largest gold mines.

Brazil's placer mines produced 11 tons of gold in 1980, compared to 2 tons in 1979. Placer output could rise to 20-30 tons in 1981, but only if these operations are better organized. A plan to do this at a cost of nearly U.S.$8 million has been presented. An estimated 20,000 miners are working placer gold deposits. Quite a number of people are licensed by the government to look for gold or any other mineral—usually placer—in Brazil. They can go on any property, and do not have to be the owner. It is estimated that the average find is 2.5 g. of gold per day per licensee.

Brazil's largest private gold mining operation has reportedly approved plans to expand its production by more than *fourfold* over the next five years. Under provisions of the proposal, which would increase annual gold mine production to 13 metric tons from present 3.3 metric tons, Mineracao Morro Velho, (meaning Old Hill), will spend more than $130-million to develop a new property and expand six current operations in Minas Gerais State. About 75 per cent of the financing will be provided by the firm's two stockholders, Bozano Simonsen Group (Brazil) and the Anglo-American Corporation of South Africa, while the rest will be put up by the government finance agency Finame. Company will also spend about $75-million on improved equipment for waste recovery, job safety and health, as well as excavation. Five-year program to raise production at existing mines and start new mine in Bahia.

Morro Velho, opened 1834, was for decades the deepest mine in the world.

A copper deposit of 600,000 metric tons is reported discovered in Goias State. It is also said to contain 40 metric tons of gold and 37 tons of silver.

Brazil's gold resources may amount to about 30,000 metric tons something like the South African figure. Only 700 tons are proven, however. Brazil has the largest potential geological gold "reserves" in the world, according to the director of Cia. de Pesquisa de Recursos Minerais, CPRM, estimated at 33,792, (another estimate is 9,000), metric tons of gold, but only 3,415 tons are rated probable and only 722 tons are rated proven.

Mine	Location	Mining Method	Size of Operation	Product
Mineracao Morro Velho, S.A.	Minas Gerais (8 shafts)	U	C	Au $213m Expansion
Tejucana	Minas Gerais		AV	Diamonds, Au
Mineracao Serras do Leste (Eluma)	Chapada, Goias	30,000 ton/day Cu, Au concs.	$300m	P/Cn Parsons-Eluma to develop

LEGEND

A — plus 3 million tonne/year
B — 1 million to 3 million tonne/year
C — 500,000 to 1 million tonne/year
D — 300,000 to 500,000 tonne/year
E — 150,000 to 300,000 tonne/year

U — underground
P — open pit
* — operation suspended

S — solution mines
AV — alluvial/beachsand mines
R — discrete tailings retreatment units

5.17 PAPUA—NEW GUINEA

	1974	1975	1976	1977	1978	1979	1980
Gold output (metric tons)	20.8	17.9	20.8	22.3	23.4	19.7	14.0

Mine output: mainly a by-product of copper mining by Bougainville.

Mine	Location	Mining Method	Size of Operation	Product
Bougainville	PNG	P	A	Cu, Ag, Au

i) Bougainville

The Bougainville gold-silver-copper mine on one of the Northeast Solomon islands has provided one-third of the PNG government's budget, paying the government $150 million in 1979 in direct taxes.

The mine is 54 per cent owned by British-controlled Conzinc Riotinto of Australia.

The byproduct gold at the large RTZ-CRT Bougainville copper mine saved the company from losses in the 1975-78 period, even though the gold recovery is only 66 to 74 per cent of that contained in the ore. In 1980, gold contributed 44.3 per cent of Bougainville's gross revenue.

Bougainville was experiencing falling grades for gold, copper and silver in the final quarter of 1980, during which contained gold output fell by 33 per cent.

ii) OK Tedi

A $1 billion gold and copper mine is possible. Final negotiations are now under way. The deposit is at OK Tedi in the far West of the country near the Indonesian border. It is estimated to have 34 million tons of gold bearing ore. A consortium comprising Standard Oil, Indiana, U.S.A., Broken Hill Proprietary (BHP), Australia and 3 West German mining companies would develop it if there is a decision to go, as is expected. 10 international banks led by Chase Manhattan Asia, stated late in 1980 that they would offer a U.S.$75 million loan to PNG in return for a partial interest in the OK Tedi project. The mine would contribute an estimated $100 million a year to the PNG government.

The Papua-New Guinea government will take up a 20 per cent interest in the OK Tedi gold-copper prospect. The operating consortium will decide whether to proceed with mining. Interests in the project are

The Broken Hill Pty. Co. Ltd.	30 per cent
Amoco Minerals	30 per cent
Kupferexplorations, W. German consortium	20 per cent.

$170 million in credits are reportedly arranged, apart from that from the participating mineral companies.

OK Tedi could produce over 7.5 tons of gold a year, as well as up to 100,000 tons of copper per annum.

iii) Porgera

The Porgera gold deposit is a project of MIM, Australia, Consolidated Gold Fields of South Africa and Placer Development of Canada.

iv) Bulolo is a small producer.

Company	Location	Project	Capacity Planned Now	Units	Investment	Start	Class	Notes
Consortium	OK Tedi, Papua—New Guinea	OP	12M	mtpd ore	$1 billion minimum	1984	AB	Oxidized cap grades 2.86 gm of Au per mt.

5.18 AUSTRALIA

In 1851, gold was discovered in Australia and in 1861 in New Zealand; Gold (and water) were discovered at Coolgardie in 1892.

	1973	1974	1975	1976	1977	1978	1979	1980
Gold output (metric tons)	17.2	16.2	16.3	15.4	19.4	20.1	18.5	17.3

A 50-pound gold nugget was found by a couple in 1980 and a Las Vegas casino has offered U.S.$1 million for it.

Prime Minister Fraser has pledged that his Government would not impose a tax on gold mining.

Western Mining (WMC)

Western Mining's main gold interests are:

Central Norseman	50.5 per cent
Kalgoorlie Mining Associates	10.2 per cent
Hill 50	38.2 per cent

—all under Western Management.

Selection Trust, U.K. has 4.45 per cent of Western Mining Corporation.

British Petroleum has taken a 49 per cent interest in Western Mining's Olympic Dam copper-uranium-gold discovery in South Australia. Massive mineralization with values of 3.23% copper and 0.68% uranium and varying gold values are indicated. IT MAY BE ONE OF THE WORLD'S MOST IMPORTANT MINERAL DISCOVERIES.

Central Norseman Gold Corporation N.L.

	1977/78	1978/79	1979/80
Gold Output (metric tons)	2.75	2.75	2.5

Central Norseman Gold Corporation N.L., Phoenix mine, opened 1936 at Norseman, 116 miles South of Kalgoorlie. 500 tpd, grade 0.47 ounce, cost U.S.$117 per ounce. Central Norseman Gold Corporation, (Western 50.5 per cent) has great ore potential in its southern extension. One reef, the Mararoa, has yielded 11 g. per metric ton to date.

Gold Mines of Kalgoorlie (Australia) Ltd.

—owned 36 per cent by Western Mining Corporation;

—has a 47 per cent equity in K.L.V., (Kalgoorlie Lake View), the managing partner of Kalgoorlie Mining Associates;

—is in a joint exploration venture with Anglo-American Corporation of South Africa in an area called Western Deeps;

—G.M.K. has an effective 24.44 per cent in Kalgoorlie Mining Associates, (see following item).

Kalgoorlie Mining Associates, (K.M.A.)—operates solely as a miner

—the 1976 partnership which owns and operates the leases of the major gold producer at Kalgoorlie;

—partners are Poseidon, (47% of KLV), G.M.K. and W.M.C., with Homestake, U.S.A. holding 48 per cent;

—operates Mt. Charlotte mine (underground) with Homestake, U.S.A. Homestake plans to reopen gold mines in the Fimiston area of Western Australia by end-1983 to produce about 3 metric tons of gold a year. $A28.5m.

	1977/78	1978/79	1979/80
Gold Output (metric tons)	2.75	3.6	3.4

	1980/81 est.	1981/82 est.
	3.2	3.4

	1981/82	1982/83	1983/84
From Fimiston leases' Output est. (metric tons)	2.1	2.2	2.9

Hill 50 Gold

—about to become a major gold producer;

—owned 36.5 per cent by Western Mining Corporation;

—W.M.C. is also the operations manager;

—redeveloping the Morning Star underground mine at Mount Magnet, 300 km. east of Geraldton, Western Australia;

—the old Hill 50 underground mine is deep, down to 3,600 feet and full of water; will not be developed until Morning Star is in production, mid-1981?;

—the 1978 discovery at Water Tank Hill may eventually be developed; Saturn open pit also.

	1981	1982	1983	1984
(June years) (metric tons of gold)	0.6?	1.2?	1.4?	1.7?

North Kalgurli Mines Ltd., (NKM)

—about to become a major gold producer;

—12.03 per cent owned by Metals Exploration;

—mostly acquired from Amax;

—its gold mines were closed for some years;

—NKM has a large 380,000 tons per annum gold mill, the Croesus, at Kalgoorlie, which is in good order.

	1982 est.	1983 est.	1984 est.	1985 est.
Gold recovery (metric tons)	1.3	1.3	1.6	2.0

Poseidon Ltd. (Pioneer Concrete may have control)

—has 24.44% interest in K.M.A.;

—has 25 per cent of the Porphyry gold deposit 160 km N.E. of Kalgoorlie, Partners are Pennzoil, 37.5% and Pioneer Concrete, 37.5%;

Beaconsfield Mine (Allstate Explorations)

—dewatering began in November, 1980;

—full production achievable in early 1984;

—Amax is earning a 50.1 per cent interest.

Telfer Mine (Open pit)

—Newmont Mining, U.S.A.;

—BHP (Broken Hill Proprietary, Australia's largest company) has 30 per cent equity;

—Output, 1979, about 5.19 metric tons of gold;

—Output, 1980, about 4.35 metric tons of gold.

The Telfer mine produces about 4 tons a year but this is declining.

EZ Industries (EZI)

Zinc mine in Tasmania that produces a good gold and silver byproduct. Gold output, 1980, about 1.1 metric ton of gold.

Peko Wallsend

—up to 3.3 tons per annum

Tennant Creek and Mount Morgan mines. In recent years, most of PW's gold came from its small rich Warrego mine, now converted to copper output.

Placer Exploration is studying the creation of Australia's largest gold mine at its Kidston deposit in Queensland. The company is investigating a 7,500 metric tons a day mining and treatment operation to produce over 4.4 metric tons of gold a year.

Reopening of Kalgoorie's Paringa gold mine in Australia is planned by Consolidated Gold Mining Areas. It hopes to raise A$15m and start milling 129,000 tpy of ore grading 7-8 gm/ton from April, 1982. The mine closed in 1966, when it averaged 14 gm/ton.

In Australia, Texasgulf has agreed to purchase 26 gold mining leases of about 24 acres each in the Leonora area of Western Australia, 150 miles north of Kalgoorlie. One of the mining leases adjoins the lease on which gold nuggets had been discovered by others in mid-September, 1980. The purchases are subject to government approval of the leases. Another 35 gold mining leases have been acquired in the Agnew area, about 85 miles northwest of Leonora, including two leases on which gold nuggets had been discovered by others. Additional gold properties are also being acquired in the Kalgoorlie area.

Some geologists say that the *Rabbit Warren* gold area in Western Australia may be unique. The area became the scene of *a hectic pegging rush* by some major Australian companies following recent discoveries of gold nuggets.

Gold Production for 1979 through 1983 is seen as follows:

(metric tons)

	Actual		Projected			
Calendar Years	1979	1980	1981	1982	1983	1984
Telfer (BHP, Newmont)	5.19	4.35e	3.73	3.42	3.11	3.11
Peko Wallsend	4.43	3.30e	3.42	3.73	3.73	3.73
Kalgoorlie Mining Associates	3.27	2.74e	4.14	5.35	5.72	6.10
Central Norseman	2.24	2.08e	2.49	2.93	3.14	3.14
E Z I	1.34e	1.09e	1.24	1.24	1.24	1.24
Mt. Lyell	0.41	0.36	0.37	0.37	0.37	0.37
Australian Development	0.20	0.28	0.53	0.53	0.53	0.53
W M C	—	0.09	0.47	1.87	2.49	2.80
Hill 50 Gold	—	—	0.68	1.37	1.59	1.59
North Kalgurli	—	—	0.62	1.28	1.40	1.74
Beaconsfield	—	—	—	—	0.90	1.81
Buddha	—	—	0.31	0.78	0.93	0.93
C G M A	—	—	—	0.16	0.72	0.72
Bamboo Creek	—	—	—	—	0.93	1.80
Spargos and QMM	—	0.06	0.19	0.28	0.47	0.62
Kia Ora	—	—	0.16	0.40	0.75	1.15
Whim Creek	—	—	0.31	0.40	0.50	0.53
Wattle Gully	—	—	0.59	0.68	0.78	0.93
Sub Total	17.08	14.29	19.25	24.79	29.30	32.84
Other	1.49					
Total	18.57	n.a	n.a.	n.a.	n.a.	n.a.

Other big producers by the mid-1980's could be Big Bell and Golden Valley.
e—estimated

Australian gold production could more than double within 4 years, to over 33 metric tons.

Source: Australian Golds, Jackson, Graham, Moore and Partners.

DEVELOPMENTS

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
Allstate Exploration/Amax/ Tricentrol	Beaconsfield, T	100,000 tonne/year Au			U	Redeveloping Tasmania mine
Great Eastern Mines/Lightning Ridge Mining	Coolgardie, WA	1,500-2,000 tonne/week Au			Cn	Considering plant upgrading to treat Au tailings
Spargos Exploration	Menzies, WA	6,000 oz/year Au		$A400,000		Later 10,000 oz from Mount Ida reopening
Western Mining	Mount Windarra, WA	Au	1981			Reopening Lancefield mine (project will include part modification of Windarra nickel mill to handle gold ore)
Pacific Copper/BMI	Orange, NSW	3 million tonne/year Cu, Au		$A50m	P/Cn	$A1m. for feasibility studies at Cadia
Peko-Wallsend	Tennant Creek NT	20,000 tonne/year Blister Cu, Au, Bi	1981 (early)	$A42m	U/Sm	Japanese loan for Gecko mine development and Sm resumption—latter now building up to full production—Upgrading Warrego Cn to coincide with Sm restart.
New Zealand						
JV	Mikonui Valley, New Zealand	4MM cu m py	1982	$28MM		Alluvial gold dredging project. MIM subsidiary. Carpentaria Exploration participates.
Syncon Mining/ Marlex Petroleum	Grey River New Zealand	Au	1982	$NZ12m		New dredge

5.19 PHILIPPINES

Mine Output

	1974	1975	1976	1977	1978	1979
Gold (metric tons)	16.7	15.6	15.6	17.4	18.2	17.1

The Philippines rank eighth in the world mine production of gold.

The largest gold producers have been:

1. Benguet—ore reserves falling
2. Philex Mining—a high producer
3. Atlas Consolidated
4. Marcopper Mining
5. Lepanto Consolidated
6. Itogon-Suyoc Mines

Atlas' prior production of gold has been:

	1977	1978	1979
(metric tons)	2.6	3.33	3.2

Benguet is the major producer: about 3.5 tons of gold a year.

Benguet plans a 2-phase expansion for its Balatoc gold mill, raising gold output to about 4 tons a year by end 1981, in the first phase and to some 4.5 tons per annum by end-1982 in the second. 6,500 gold miners went on strike early in January, 1981.

Benguet is operating, (for half the revenues), the new open pit copper-gold mine at Dizon, (for Dizon Copper Silver Mines), which should produce about 3.2 metric tons of gold a year, but there are persistent equipment problems.

Atlas Consolidated—largest mine producer of copper in the Far East—opened the open pit Masbate gold-silver mine late in 1979. The first gold was poured on January 24, 1980. Annual output is about 3 metric tons of gold. Ore reserves are about 70 tons of gold.

Mine	Location	Mining Method	Size of Operation	Product
Benguet Cons.	Benguet	U	C	Au, Ag, Cu
Itogon	Benguet	U	E	Au, Ag
Masbate	Cebu	P	D	Au
Placer	Surigao del N.	U	E	Au
Frank	Cebu	P	A	Cu, Au, Ag
Biga	Cebu	P	A	Cu, Au, Ag
Kennon	Benguet	U	B	Cu, Au, Ag
Kepanto	Benguet	U	B	Cu, Au, Ag
Lutopan	Cebu	U	A	Cu, Au, Ag
Marcopper	Marinduque	P	A	Cu, Ag, Au
Marinduque (Sipalay)	Negros Or.	P	A	Cu, Au, Ag, Mo
San Marcelino	Zambales	P	A	Cu, Au, Ag
Santo Nino	Mt. Prov.	P	B	Cu, Au, Ag
Santo Thomas II	Mt. Prov.	U	A	Cu, Au, Ag
Western Minolco	Baguio	P	B	Cu, Au
Big Wedge	Benguet		AV	Au

DEVELOPMENTS

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
Atok (with Benguet)	Big Wedge, Benguet	600 tonne/day Au	1980-1	P22.5m	U	Benguet to expand mine from 100 tonne/day
Metals Exploration Asia	Camarines Norte, Luzon Paracale, Philippines	500 tonne/day Au	1982	U.S.$20MM	U	Reopening Paracale mine; also developing Longos Shaft sinking by Pearson Bridge Pty.
Batong-Buhay Gold Mines	Philippines mi/co	9M mtpd ore	1981	$240MM	A	OR: 54.3MM mt at 0.12 to 0.37 gm Au per mt and 0.599% Cu.

5.20 ZIMBABWE

Zimbabwe may have been the greatest gold field of the ancient world. The remains of the mines are found in an area 500 miles long and 400 miles wide. Identification as a gold source for the Sabaeo-Phoenicians of the Yemen, the Hindus, the Persians and possibly the Egyptians, has been studied by scholars. Mwenemutapa (called Mashonaland in recent times) was a kingdom of southeastern African between the 14th and 18th centuries, with its capital probably at Zimbabwe. It was famous for its gold deposits, which attracted Portuguese traders based in Moçambique from 1505 onwards. An estimated 50 metric tons of gold were taken from these prehistoric workings by crude methods.

	1974	1975	1976	1977	1978	1979	1980
Mine output: Gold (metric tons)	18.6	18.6	17.1	20.0	17.0	14.0	13.0

Gold exports recommenced in 1905, under British rule.

After Canada and Brazil, this country probably has greater potential than most countries for expansion of mine output of gold.

Most of Zimbabwe's extra mineral output and revenue will come from gold, in the short run. The Zimbabwe mining law has provided the incentive to develop the many small gold deposits which predominate there.

Gold output could double in 1981. New sizeable gold reserves have been discovered. Rio Tinto opened one large new mine at Renco, in SE Zimbabwe, which is increasing production. A gold mine at that site will be producing gold by early 1982, at about 1.5 tons a year. Around U.S.$17 million has been invested in it. Falcon's Dalny mine has been the largest single gold producer. Lonrho, with some medium sized mines is the largest corporate gold producer.

30 per cent of Zimbabwe's silver arises as a byproduct of gold mining.

Zimbabwe's exports, led by gold, increased in value in 1980 by about 63 per cent.

Mine	Location	Mining Method	Size of Operation	Product
1. Dalny (Falcon Mines)	Chakari	U	E	Au
2. Inyati, of the Coronation Synd. (Lonrho)	Headlands	U	E	Cu, Au, Ag
3. Ventures of Africa (Falconbridge)				

Production at Falconbridge's Golden Kopje property in the north of the country is planned for late 1982.

DEVELOPMENT

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
Rio Tinto Mining (Zimbabwe)	Nr. Fort Victoria	Au/Cu		$R12m		Renco mine expansion

5.21 DOMINICAN REPUBLIC

	1975	1976	1977	1978	1979	1980e
Gold output (metric tons)	3.0	12.7	10.7	10.8	11.0	11.8

(also about 45 metric tons of silver per annum)

Pueblo Viejo open pit gold mine of Rosario Dominicana, S.A., (Rosario Resources)

Mine	Location	Mining Method	Size of Operation	Product
Pueblo Viejo (opened in 1975)	Sanchez (Originally discovered in 1494.) One of the largest open pit gold operations in the world. 3 million tons per annum of ore.	P	A	Au, Ag

Major product: Doré Bullion

The new gold and silver refinery will have an annual capacity of 75 tons of bullion and becomes operational in mid-1982. It will process feed from the Pueblo Viejo mine, which now goes to U.S.A. and Europe.

5.22 GHANA, (GOLD COAST), WEST AFRICA

	1975	1976	1977	1978	1979
Gold output (metric tons)	16.3	16.6	16.9	14.2	11.5

Up to about 1350, at least two-thirds of the world's supply of gold came from West Africa. Gold originally attracted Europeans to the coast in the late 15th Century and still accounts for about 8 per cent of export values.

Mine	Location	Mining Method	Size of Operation	Product
Ashanti Mines	Obuasi	U	C	Au
State Gold Mining	Prestea	U	D	Au, Diamonds
State Gold Mining	Tarkwa	U	E	Au
State Mines	Dunkwa		AV	Au, Diamonds (New shaft, 1983)

Ashanti Gold Fields Corporation Ltd. is the major producer. The Ashanti mine, (government 55 per cent, Lonrho 45 per cent), is still one of the highest grade gold mines in the world—about 6 ounces of gold per metric ton of ore over thicknesses of about 10 feet. The Bibiani gold mine nearby is not so fortunate.

	1979/80 (metric tons)
Ashanti (Lonrho, U.K., 45 per cent), at Obuasi	7.5
Prestea, (state owned)	2.6
Tarkwa, (state owned)	1.25
Dunkwa (state owned)	n.a.
Konongo (state owned)	n.a.
Total	11.5

The Ghana government is going all out to increase gold output, which has fallen in the last 6 years. There has been no new gold venture there since 1938.

THE GHANA MINING TAXES ARE SAID TO BE THE HIGHEST OF ANY GOLD-PRODUCING COUNTRY. GHANA RANKED FIFTH IN THE WORLD IN GOLD OUTPUT IN 1961, BUT HAD SLIPPED TO TENTH BY 1979.

The Ghana government wants to increase gold output to 60-85 tons by the year 2000. Figures of U.S.$1.3 billion investment needed over the next 10 years and a total investment of U.S.$3 billion by 2000 are talked of.

Liberalized laws would be needed to attract that amount of capital.

There is an acute shortage of qualified personnel.

Ghana officials calculate that up to U.S.$36 million worth of gold is smuggled out of the country each year.

5.23 COLOMBIA, SOUTH AMERICA

Economically, the country's vast potential, and the ease with which it could be realized, has been well illustrated with the opening up of a new gold industry that could add a further $400-million to Colombia's reserves in 1980. The balance of payments surplus is likely to be between $900-million and $1.4-billion.

Colombia was, until recently, the largest gold producer in Latin America. Many old mines have reopened.

Colombia was an early source of gold in the New World. Colombia has deposits of placer gold and may have the largest deposits of native placer platinum in the world, located in the "Green Hell" of the Choco jungle. Placer mining under the Spanish started in 1778. Gold and platinum group metals are co-products in the Colombian placer deposits. IN THE 1920's, COLOMBIA PRODUCED ABOUT HALF OF THE PLATINUM MINED IN THE WORLD.

Major Producers: Mineros de Antioquia
Mineros del Choco

	1974	1975	1976	1977	1978	1979
Gold output (metric tons) —estimated	8.2	10.8	10.3	9.2	9.0	10.0

Illegal Mining

A study carried out by Ecominas, the Colombian Government minerals agency, has shown 90% of the country's gold, silver and platinum mining to be illegally undertaken. It is done without miners first applying for permission to exploit the precious metals. According to Colombian law, the subsoil and resources it contains belong to the state.

Production by natives panning in jungle streams for gold and platinum is presumed to account for over half of the country's output currently.

The crude placer is usually exported to the U.S.A. for refining.

Gold and silver are mined or dredged in the Antioquia department and platinum at Choco. Emeralds are mined in the Boyaca department.

Platinum-surfaced gold pendants and nose rings made by Amerindians before Columbus have been discovered in Ecuador and preserved in New York at the Museum of the American Indian. What is now Colombia and Ecuador was a part of the Spanish Captain-Generalship of New Granada. South American Indians used blow-pipes in working the metal and added copper to lower the melting point. Bogota's famous Gold Museum has many examples of ancient Indian gold artifacts.

In the early years of Spanish rule, profitable frauds became possible by gilding alloys of Colombian platinum, silver and copper, (all much cheaper than gold in the old days), and passing them off as gold. For many years, it was forbidden to import platinum into Spain. The Spanish once made the fatal error of defrauding some Dutch traders with such platinum coins passed as gold. The Dutch returned to the scene and hanged them from a yardarm.

5.24 CHINA

Gold was regarded as a precious substance in ancient China. New discoveries reveal a high degree of skill achieved by Chinese goldsmiths of the ancient dynasties. Production of gold and silver in China dates from later than 1,000 B.C.

Around the time of the birth of Christ, a large proportion of gold output in China was won from the deposit area Northwest of Hsin-kan, East of Ch'ang Sha Province, in South Central China.

China may become the world's third largest mine producer of gold in a few years. China may be producing about 20 to 30 metric tons of gold from its placers and mines, with a potential that may take it to 100 tons per annum or higher in a few years. A major expansion program, with increased mechanization, is under way. Some Western experts say it could roughly double China's gold output by 1984.

The principal gold producing provinces in China appear to be Jiangsi (Kiangsi), Zhejiang (Chekiang), Henan (Honan) and Shandong (Shantung). Many gold occurrences are reported throughout Eastern and Southern China, (Heilong Jiang, Hei-lung Chiang, i.e. the Amur river, and in Szechuan province).

Other gold producing provinces may be Jilin, Hebei, Hubei, Hunan and Guangxi, adjacent to Hong Kong.

	1950	1965	1970	1971	1972	1973	1974
Gold output, estimated (metric tons)	3.4	2.0	1.6	1.7	1.8	1.8	2.0
			1975	1976	1977	1978	1979
			1.9	2.5	3.1	4.7	6.2

Gold output in China rose 14.3% to a record level in 1980, but the government news agency gave no actual figures. Consolidated Gold Fields put China's gold output at 30 to 50 metric tons a year. Reserves in the known deposits are moderately good. Silver supplies are adequate, but geological reserves are poor.

Gold mining experts of Consolidated Gold Fields, London were allowed to visit old and new gold mines in Shandong in late 1979 and published details in May, 1981. The estimated 1979 output of these mines was about 3 metric tons of gold, but the visitors calculate that, with current expansion plans, total output could reach 8.5 metric tons of gold a year.

Their estimate for all of Shandong's mines was 9-11 metric tons in 1979 and a potential in the 1980's of 15-17 metric tons of gold a year.

A major deposit of platinum, palladium, osmium and iridium is said to have been discovered in the Dali area of Bai, Yunnan Province.

China could utilize more domestic production of gold, even though the present level allows a useful quantity for international bullion trading which is mainly done through London, (but the Hong Kong and Zurich markets are also used.) China's gold trading in 1980 was extremely skilful.

In 1976, after the arrest of the Gang of Four, China delivered up to 80 metric tons of gold to London, almost certainly from reserve bullion stocks, to raise sorely needed foreign exchange for purchases of food and raw materials.

China's reserves of refined gold bullion are currently estimated as some 230 metric tons, about the same as Australia's and equivalent to one third of Britain's.

	Location	Capacity Planned	Now	Units	
Government	Wei Fang, Shandong, China	3M	1M	mtpd ore	Davy McKee doing feasibility study

5.25 NORTH KOREA

Output about 15 tons of gold a year. Primarily vein deposits North of Pyongyang. Also as a byproduct of copper and tungsten mining.

South Korea

Output 0.5 metric ton of gold per annum. Primarily small mines.

5.26 MEXICO

	1974	1975	1976	1977	1978	1979
Gold output (metric tons)	3.9	4.7	5.4	6.6	6.2	5.5

Mine	Location	Mining Method	Size of Operation	Product
Cuaie	Jalisco	P/U	D	Au, Ag + Pb, Zn, Cu
Avino	Durango	U	E	Ag, Cu, Au
Las Torres	Guanajuato	U	C	Ag, Au
Macocozac	Chihuahua	P/U	D	Cu, Ag, Au
Naica	Chihuahua	U	C	Zn, Pb, Ag, Cu, Au

From January 1, 1981, Mexico is permitting the export of gold, banned since 1949. This will stimulate gold mining, particularly in the States of Jalisco, Michoacan, Oaxaca, Sinaloa and Sonora.

Mexico is blessed with more natural resources than West Germany and Japan combined.

In Mexico, mining could eventually prove to be more profitable than oil. (Mexico's main oilfields are located only a few miles from strife-wracked Guatemala.) Mexico is once again the world's leading mine producer of silver.

Already, 75 per cent of the population is under the age of 25, i.e. over 50 million such young people. The estimated 1980 population total is 67.5 million—plus the 8 to 10 million who have made it across the border to the U.S.A., often illegally.

Industrial Minera Mexico, (IMM), (formerly Asarco), produces about 1.3 metric tons of gold a year.

Guanajuato area: produced 31 metric tons of gold between 1548 and 1967. (Cia. Minera las Torres S.A. there is the largest single silver-gold mining operation in the world.) Production at this mine commenced in 1976. Las Torres is one of the world's richest silver mines, (10.5 oz. per ton), with 0.6 oz. gold per ton. Las Torres is owned 33 per cent by Ind. Penoles, 37 per cent by Cia. Fresnillo and 30 per cent by Lacana Mining of Canada. It should produce 1.3 metric ton of gold a year.

Hidalgo de Parral in the mining State of Chihuahua, south of El Paso, Texas, is a centre of gold, silver, zinc and lead mines.

The modern gold mining town of Cananea, (Compania Minera de Cananea, (Rosario Resources 27 per cent)), in the State of Sonora, is near the U.S. border south of Tucson, Arizona, (Anaconda 49 per cent).

Cia. Negocacion Minera Santa Maria de la Paz y Anexas is a small producer.

Iguala in the State of Guerrero, on the Pacific coast, is well known for its rich gold and silver deposits. Taxco was the home of Joseph le Borda, famed French miner. Acapulco is also in this State. There is a new project at Pinzan Morado.

The State of Hidalgo is rich in gold ore deposits. Compania de Real Del Monte y Pachuca, (formerly U.S. Smelting, Refining and Mining Co.), at Pachuca produces about half a ton of gold a year. The capital, Pachuca, is the centre of the mining district.

Expansion and Development

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
Mexicana de Avino	Avino, Durango	2,550 tonne/day Au, Ag, Cu, Pb	1981	$2-3m	U/P/Cn	Mill expansion from 600 tonne/day, to 1,050 tonne/day due on-stream early 1981; Phase 2600 tonne/day addition will follow; third phase adding 900 tonne/day is being planned.
Industrias Penoles, S.A. de C.V.	Tepehuanes, Durango	2,000 tonne/day Au, Ag, Pb, Zn	1982		U	Considering development of La Cienega.
Industrial Minera Mexico, S.A.	Santa Barbara, Chihuahua	5,000 tonne/day Cu, Ag, Au, Pb, Zn	1982	P752m	U	Shaft sinking delays retarded mine expansion from 3,000
Industrial Minera Mexico, S.A.	Rosario, Sinaloa	250,000 tonne/year Pb ore with Cu, Zn, Au, Ag	1982		U/Cn	Development underway for March 1982 start up
Cia. Fresnillo, S.A. de C.V.	Fresnillo, Zac., Mexico	2.5M mtpd ore	1983		A	Constructing open pit and cyanidation plant to process oxide ore of silver and gold.

5.27 JAPAN

Mine output is about 4 metric tons of gold a year.

(metric tons of gold)

1950	1960	1965	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
4.2	8.1	16.1	7.9	7.9	9.6	10.4	5.5	4.7	4.0	4.6	6.1	7.0

Mine	Location	Mining Method	Size of Operation	Product
Kushikino	Kagoshima	U	E	Au, Ag
Shimokawa	Hokkaido	U	D	Cu, Au, Ag, Zn

Private gold market trading in Japan will start up on May 29, 1981.

5.28 PERU

	1974	1975	1976	1977	1978	1979
Gold output (metric tons)	2.7	2.9	3.0	3.4	3.9	4.7

Mine	Location	Mining Method	Size of Operation	Product
Casapalca	Casapalca	U	C	Ag, Zn, Pb, Au, W
San Juan de Lucanas	Ayacucho	U	E	Ag, Au, Cu, Pb
Quiruvilca	Cajamarca	U	D	Cu, Zn, Pb, Ag, Au
Atacocha (Chicrin)	Cerro de Pasco	U	D	Pb, Zn, Ag, Au

Development

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Remarks
Centromin	Monterrosas	Cu, Mo, Au	1980's	$12m	Developing deposit near Ica

5.29 CHILE

Produces about 3.5 tons of gold a year.

Mine	Location	Mining Method	Size of Operation	Product
1. El Salvador	Atacama	U	A	Cu, Mo, Ag, Au
2. Chuquicamata (doré)	Santiago			Cu, Au, etc.

The U.S.$240 million El Indio mine in La Serena, 540 km North of Santiago, 80 per cent owned and developed by St. Joe Minerals, opening in June/July 1981, is to produce some 5 to 7 metric tons of gold a year, as well as 22 tons of silver and 8 tons of copper. Gold has already been produced at the mine.

5.30 ZAIRE

Gold Output (metric tons)

1950	1960	1965	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
10.6	8.0	2.8	5.6	5.4	2.5	4.2	4.4	3.6	4.0	3.0	1.0	1.5

Major Producers

Mine	Location	Type	Product
Cie. Grand Lacs Africains	Kivu	AV	Au, Sn
Kilo-Moto, Bunia. (Gold Mines of Kilo-Moto Ltd.)	Kivu	AV	Au

5.31 INDIA

	1974	1975	1976	1977	1978	1979	1980
Gold output (metric tons)	3.2	3.0	3.3	2.9	2.8	2.57	2.41

Gold output declined from 6.417 metric tons in 1951 to 1.711 ton in 1974 at the 2 mile deep (3.2 km) Kolar Gold Fields in Mysore in South India.

In the days of the Mogul (Mongol) Empire—which the British displaced—gold mines in NW India were exploited.

Gold Consumption: The desire in India for gold for dowries, jewellery etc. is unabated and much gold is smuggled into the country.

Mine	Location	Mining Method	Size of Operation	Product
Hutti Gold Mines Co. Ltd. n.b. Hutti Gold Mines is owned by the State of Karnataka.	Bangalore, Karnataka.	U	E	Au
Kolar (Bharat Gold Mines Ltd.) (government-owned)	Karnataka (Oorgaum)	U	D producing at great depths, 10,000 feet in some areas. In 1980, 1000 tpd, grade 0.15 ounce, cost U.S.$287 per ounce.	Au

Reopening

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Remarks
Bharat Gold Mines	Anantapur, AP	Au	1981	Reopening Ramagiri mines

5.32 NICARAGUA

Mine output: 2 tons of gold a year.

The Nicaraguan government's Finance and Planning Ministries are supplying U.S. $225 million to various concerns to reopen three gold and silver projects closed for decades, San Alpino, La Reina and La Libertad.

Noranda has 60.5 per cent in the Empresa Minera de el Sententrion mine, the largest gold producer.

Mine	Location	Mining Method	Size	Product
Sententrio	Managua	U	E	Au
Siuna	Managua	U/P	C	Au
Vesubio	Zelaya	U	E	Zn, Pb, Cu, Au, Ag

5.33 SIERRA LEONE

Sierra Leone has alluvial gold.

At the Baomahun sizable gold find, 125 miles east of Freetown, the capital, ore values of drill holes are of a high grade. Some claim that they may be the richest in the world.

Earlier drilling took place in the 1960's. The ore intersections—depth of gold bearing ore—are at over 2,000 feet and thus some of the deepest found anywhere in recent years and are conveniently near the surface. Mining costs by open pit methods and low cost labour will be minimal. Two additional drilling rigs are enroute to the site.

The Canadian company, Eurocan, is in charge of the venture and is quietly optimistic.

The government has been trying for a World Bank loan to open up the area for part of a U.S.$200 million hydro power plant. At least U.S.$50 million will be needed to get mines going. Seems unlikely before the 1990's. Economic woes feed dissent. Diamond output has plummetted. Any imposed austerity could spark a revolt long before any gold is produced.

5.34 MONGOLIA

Gold is mined (placer) and large deposits of silver have been found recently in this dependency of the Soviet Union. Gold is sent to the U.S.S.R. in payment for fuel, equipment and services. Mongolia is the largest land-locked state in the world, nearly three times the size of France.

5.35 AFGHANISTAN

Gold deposits are known in Afghanistan, now controlled by the Soviet armed forces.

5.36 ETHIOPIA, (FORMERLY ABYSSINIA)

Some gold and platinum is mined, mainly placer, from the Adola mine.

	1950	1960	1965	1970	1971	1972	1973	1974
Gold Output (metric tons)	1.354	1.273	0.754	0.849	0.762	0.646	0.78	0.6

5.37 ANTARCTICA

An Antarctica Treaty was signed by 12 interested powers in 1959, which froze all political claims until 1989.

The shield area of Greater Antarctica contains gold deposits. Commercial production appears unlikely today.

5.38 SWEDEN

Boliden Metall AB is to open a new mine at Enaasen on the West Coast to exploit a gold deposit. Start up is expected in 1982. Ore reserves are 1 to 2 million metric tons.

Over 2 metric tons of gold a year have been produced, mainly at the Remstrom pyrite mine, of Boliden A/B.

5.39 PORTUGAL

Mine	Location	Mining Method	Size	Product
Dos Mouros	Tras-os-Montes	U	E	Au

5.40 SPAIN

Mine	Location	Mining Method	Size	Product
Cerro Colorado (Rio Tinto Patino)	Huelva, SW Spain	P	A	Cu, Au, Ag; around 3 metric tons of gold a year.

5.41 FRANCE

Mine	Location	Mining Method	Size	Product
Mines et Produits Chimiques de Salsigne (2 mines) Over 1 ton of gold a year. Aude		U	E	Au, Ag, Bi Seeking partners, $31m finance to double mine output

5.42 HAITI

Mine	Location	Mining Method	Size	Product
Sedren	Meme	U	E	Cu, Au

5.43 HONDURAS

Mine	Location	Mining Method	Size	Product
El Mochito (Rosario Resources)	Santa Barbara	U 2,250 tonne/ day, Au ore. 1981	D	Zn, Pb, Ag, Au $14.5m. Mine expansion from 1,200 tonne/day

5.44 FIJI

Mine	Location	Mining Method	Size	Product
Emperor Output 1.5 tons of gold a year.	Vatukoula, on Viti Levu island	U/P Fiji	D	Au

Emperor shipped 0.872 metric ton of gold in the year ending June, 1979.

5.45 ROMANIA

Baia Mare is a gold producing region.

The great gold treasure of Petroasa was transported to Moscow during the War and has never been returned.

5.46 INDONESIA

DEVELOPMENTS

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
PT Tropic Endeavour	Marisa, Sulawesi	Au			A	Feasibility study of alluvial deposits with reserves of 5 million m^3 of 500 mg Au/m^3 is in progress
Freeport	Gunung Bijih-Ertsberg, Irian Jaya	9,500 tonne/day Cu ore plus Au, Ag	1982	$101.5m	U	Development program on schedule in budget; will raise Cu in output to 135 million pounds in 1981
PT Tropic Endeavour	Kayubulan, Sulawesi	Porphyry Cu, Au			P/Cn	At Kayubulan preliminary studies indicate potential for P mining 160 m tonnes ore in north and to the south a second pit with reserves of 36 m tonnes. Work continuing; partners sought.

5.47 MALAYSIA

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
Bidor	Perak	Sn, Ti, Zn, Au, Monazite			AV	

Malaysia has limited deposits of gold.

5.48 PAKISTAN

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
Pakistan Mineral Development Corp. (PMDC)	Gilgit/ Chitral	5,000 tonne/day Au		Rs30m	A	Trial production underway with Austro-Mineral for placer mining.

5.49 ECUADOR

Company	Location	Design Production (ore, unless otherwise stated)	Com-ple-tion Date	Capital	Type of Oper-ation*	Remarks
DGGM (Gov't)	Chaucha, Azuay	Cu, Au, Ag, Zn, Pb			U/Cn	Reassessing 50 million tonne porphyry ore-body

5.50 COSTA RICA

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
United Hearne/ Barranca	Santa Clara	3,000 tonne/ day Au	1985		P/Cn	Presently using 500 tonne/day cyanide leach pilot plant

5.51 ARGENTINA

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
YMAD/Fabricaciones Militares	Bajo La Alumbrera Catamarca	Cu/Au	1984		P	Mine development proposed, finance required
Cia. Minera Vulcan	Salta	Pb, Ag, Zn, Cu, Au				Developing Vulcan/Sorache mines

5.52 SAUDI ARABIA

Company	Location	Design Production (ore, unless otherwise stated)	Completion Date	Capital	Type of Operation*	Remarks
Petromin/Gold Fields	Mahd adh Dhahab	120,000 tonne/year Au ore			U/Cn	Cons. Gold Fields studying feasibility of reworking ancient deposit.

Consolidated Gold Fields said that a decision to go ahead with the Mahd adh-Dhahab gold project is likely by early 1981. Start-up is expected in 1983. It may produce between 3 to 4 metric tons of gold a year. This is believed to be the site of the legendary Ophir gold source mentioned in the story of the Queen of Sheba and Solomon.

LEGEND

A — plus 3 million tonne/year
B — 1 million to 3 million tonne/year
C — 500,000 to 1 million tonne/year
D — 300,000 to 500,000 tonne/year
E — 150,000 to 300,000 tonne/year

U — underground
P — open pit
* — operation suspended

S — solution mines
AV — alluvial/beachsand mines
R — discrete tailings retreatment units

5.53 VENEZUELA

About 0.56 metric ton of gold was produced in 1975.

By 1981 a new project may be on stream. Capacity to produce 6.22 metric tons of gold a year, (together with the Nuero Carazon mine.)

El Callao gold mine reopening by the State-owned Minerven concern, $10 million. Output to be perhaps 4.66 metric tons of gold a year. Grade 0.7 oz. per ton.

The Nuero Carazon de Jesus project came on stream in 1976 and capacity has been increased by 50 per cent. Reserves may be small but very high grade and good nearby potential.

Prospective Gold Producers

In Africa, Ivory Coast, Upper Volta, Benin, (formerly Dahomey), Somalia and Algeria may become mine producers of gold; in Asia, candidates are Yemen, Iran, Nepal and Laos.

5.54 MONIES FOR EXPLORATION—THIRD WORLD

Only 15 per cent of exploration expenditure is currently directed to Third World countries.

The U.S.A., Canada, Australia and South Africa, (all English speaking and politically stable), accounted for the bulk of such expenditure. A spokeman for Boart International said in late 1980 that the biggest mineral exploration worldwide is in the U.S. and South Africa, closely followed by Canada and Australia, with oil companies funnelling larger sums of money into the mining industry.

The concerns of the private sector have inhibited the undertaking of expensive mineral exploration in the Third World, where the growing politicisation of the mining industry is a major factor.

The U.N., via its agencies, has made an exploration effort in Third World countries, but its total contribution, even with the counter part funding by host countries, still only adds up to the average expenditure of one large mining company.

The Lomé II Convention does not assign any priority to mining.

The recession in the U.S.A. etc., together with the fall in some metal prices, reflect in part some major readjustments in the world. The political-economic framework for the mineral sector has greatly changed and will change further. Options are becoming narrower.

The factors contributing to instability—political upheaval, with military attacks, e.g. on SASOL, South Africa, strikes, energy costs, technological change, substitution, declining demand (in some cases), excess production capacity and the build-up of stocks of metals and minerals by producers, consumers and governments—will not go away, it seems.

The fundamental problem is the price of the metals or minerals, NOT worry by consumers over long term security of supply. Metal and mineral prices will rise or fall to whatever levels are required to satisfy demand.

Foreign Debt

Brazil	$58 billion
Soviet Union	$50 billion est.
Mexico	$34 billion

Poland owes the West over U.S.$20 billion. Poland is not able to pay the interest on these funds.

West German banks are major lenders to Poland and if Poland defaulted on its loans, could lose up to U.S.$5 Billion.

A total of about U.S.$100 billion is owed to the West by the Soviet bloc of countries.

Chapter 6

6 SUPPLY AND DEMAND—WESTERN WORLD

6.1 GOLD—WORLD SUPPLY AND DEMAND

Overall supplies of gold bullion in the Western World fell to about 1100 metric tons in 1980.

Understandably, the price remained high.

World Supply and Demand Picture

This is the story of bullion and billions. The present situation is exceptionally confused. The normal commodity supply-demand relationships do not apply to refined gold, because of its unique dual function in the world, i.e. its continuing "monetary" status and its use in "industry". Gold is extremely durable in that *current world mine production is extremely small, relative to the large existing refined stocks already above ground.*

Since world mine output of gold is now insufficient to meet strong world demand, the gap has been largely filled by some sales by hoarders, sales from official reserves and recoveries from scrap.

GOLD BULLION SUPPLY AND DEMAND 1949-1979 (metric tons)

Year	Free World Mine Production	Net Trade With Communist Bloc	Total Supplies	Official Purchases or Sales*	Net Private Purchases
1949	733	—	733	396	337
1950	755	—	755	288	467
1951	733	—	733	235	498
1952	755	—	755	205	550
1953	755	67	822	404	418
1954	795	67	862	595	267
1955	835	67	902	591	311
1956	871	133	1,004	435	569
1957	906	231	1,137	614	523
1958	933	196	1,129	605	524
1959	1,000	266	1,266	671	595
1960	1,049	177	1,226	262	964
1961	1,080	266	1,346	538	808
1962	1,155	178	1,333	329	1,004
1963	1,204	489	1,693	729	964
1964	1,249	400	1,649	631	1,018
1965	1,280	355	1,635	196	1,439
1966	1,285	−67	1,218	−40	1,258
1967	1,250	−5	1,245	−1,404	2,649
1968	1,245	−29	1,216	−620	1,836
1969	1,252	−15	1,237	90	1,147
1970	1,274	−3	1,271	236	1,035
1971	1,236	54	1,290	−96	1,386
1972	1,184	213	1,397	151	1,246
1973	1,121	275	1,396	−6	1,402
1974	1,007	220	1,227	−20	1,247
1975	954	149	1,103	−9	1,112
1976	969	412	1,381	−58	1,439
1977	972	401	1,373	−269	1,642
1978	980	410	1,390	−362	1,752
1979	962	229	1,191	−574	1,765

* Definition of official sales has been extended from 1974 to include activities of Government controlled investment and monetary agencies in addition to central bank operations. This category also includes IMF disposals.

Source: Consolidated Gold Fields Ltd.

GOLD: WORLD SUPPLY/DEMAND—ESTIMATED

Demand for Gold on the Free Market

	1969	1970	1974	1976	1978	1979*	1980e
				(in metric tons)			
Industrial Requirements of which:	1207	1272	437	1149	1248	992	555
Manufacture of Jewellery	901	1062	232	931	1001	737	350
Electronics	102	89	92	76	85	94	90
Dentistry	65	59	57	76	87	86	85
Others	n.a.	62	56	66	75	75	30
Medals	71	54	7	47	45	40)	210
Official minting	n.a.	46	288	184	215	210)	
Gold for processing	1205	1372	732	1380	1508	1242	765

Supply of Gold on the Free Market

	1970	1974	1976	1978*	1979*	1980e
			(in metric tons)			
Western mine production of Gold:	1274	1007	969	980	962	947
Plus (purchases) and sales respectively by the Eastern Bloc and (purchases) and disposals respectively by the IMF and other monetary authorities, net; excluding sales from non-government surface stocks and "secondary" gold recoveries.						

* some estimates by Credit Suisse; e—estimated.

Gold Dealers

Some of the more important dealers in gold and other physical precious metals around the world are:

U.S.A and Canada

J. Aron and Company, New York
Johnson Matthey, Pennsylvania, New Jersey and Brampton, Ontario, Canada
Engelhard Minerals, New York, New Jersey and Aurora, Ontario
Philipp Brothers, Division of Engelhard, New York and Montreal
Handy and Harman, New York and Toronto, Ontario
J. A. Samuel, New York
Bank of Nova Scotia, Toronto, Ontario
Gerald Metals, New York
Simmons Refining Company, Chicago
Delta Smelting and Refining Company, Richmond, British Columbia
Gemini Industries Inc., Santa Ana, California
Imperial Smelting and Refinery Company, Markham, Ontario

U.K.

N. M. Rothschild
Johnson Matthey Metals
Samuel Montagu
Mocatta
Sharps Pixley
Engelhard, Sutton, Surrey
Ayrton Metals
Gerald Metals
William Rowland Limited, Sheffield, Yorkshire

Switzerland

Crédit Suisse, Zurich
Swiss Bank Corporation, Zurich
Union Bank, Zurich
Metaux Précieux S.A., Neuchatel

West Germany

Degussa (Deutsche Gold und Silber Scheide-Anstalt), Frankfurt
W. C. Heraeus, Hanau
DODUCO K. G., Pforzheim

France

Cie. des Métaux Précieux, Paris

Belgium

Metallurgie Hoboken

Italy

Metalli Preziosi, Paderno Dugnano
Industrie Engelhard SpA, Rome

Japan

Mitsui
Mitsubishi

GOLD ORGANISATIONS PROMOTING THE USE OF GOLD

GOLD INSTITUTE

The Gold Institute acts mainly as a public relations body to foster the use of gold.

Members

Gold mining companies, refiners and manufacturers, central banks in some countries, chartered banks, and suppliers of gold and gold products. Total membership comprises 49 organizations from 11 countries.

Budget

Assessed dues from members calculated on the basis of accountable gold in ores and concentrates shipped, plus ounces of gold refined, plus ounces of gold content in products fabricated or manufactured.

Headquarters

Washington, D.C., U.S.A. with the financial office in Toronto, Ontario, Canada.

Objectives

To encourage the development and use of gold and gold products.

To help develop markets for gold and its products.

To foster research and development related to the present and prospective uses of gold.

To spread knowledge and understanding of the uses of gold.

To develop methods for improving the welfare of the gold industry.

To collect and publish statistics and other imformation about production, distribution, marketing, consumption and the uses of gold and gold products.

Organization

Institute affairs are carried out by a private U.S. management firm, with the president of that firm acting as Manager of the Institute.

Distribution of information through a monthly newsletter, brochures, etc.

Sponsors meetings and organizes symposia on matters relating to the use of gold.

Sources of Data

The Gold Institute is organizing to publish mine production data annually based on information obtained from questionnaires submitted to mining companies. Refining data are assembled on the basis of confidential submissions from refiners and are available to members only.

INTERNATIONAL PRECIOUS METALS INSTITUTE

The International Precious Metals Institute, (I.P.M.I.), of New York is an international association of miners, refiners, producers, users, research scientists, merchants and governments formed

1) to encourage the exchange of technology and information such as publishing of data and statistics
2) to conduct educational meetings and
3) to continually promote the greater use of gold and silver and the platinum group metals.

It covers the whole range of gold usage and has issued some data on uses and statistics.

The institute is a non-profit organization whose main objective is to coordinate information in all areas of precious metals, as well as provide liaison between industry, conservation groups, governments educational institutions and the general public in problem solving and in the dissemination of information in the areas of vital uses of precious metals.

A further objective is to cooperate with, but not compete with, established precious metal trade, scientific and educational organizations.

The late Ray Vines of International Nickel of Canada Ltd., (Inco), came up with the original concept of this successful organization. After several years of study, a small group of enthusiasts came to the conclusion that

1) there was a need for such an institute, and
2) a neutral ground, such as a university, was needed to nurture the seedling.

The Institute came into being in 1975.

GOLD PROMOTION BY "INTERGOLD"

The South African Chamber of Mines, representing most of the country's mines, formed a company in 1970, the International Gold Corporation, (IGC), to promote more sales of gold for non-monetary purposes; maintains a gold promotion and marketing organization, ("Intergold").

The International Gold Corporation, European Head Office, Geneva, Switzerland, with offices in France, West Germany, Italy, Spain and U.K., was established in 1971 to promote the use of gold for industrial purposes.

Since the jewellery and watch industries absorb the largest part of the world's annual mine output of gold, the organization concentrates its efforts on this sector, directed at creating an increased consumer interest in gold jewellery and thus providing additional demands for gold at all levels of the jewellery trade and industry.

I.G.C. cooperates with manufacturers, wholesalers, retailers and associations to reach the consumer through advertising, product catalogues, point-of-sale material and editorial information.

GOLD INFORMATION CENTER, 645 FIFTH AVENUE, NEW YORK CITY—dispenses popular information on gold.

SUBSTITUTION OF GOLD BY PALLADIUM OR PLATINUM IN INDUSTRIAL USES AND IN THE ARTS

Substitution

The tremendous rise in the price of gold has stimulated the use of palladium, displacing some gold, in industry—much to the advantage of the Russians who mine 70 per cent of the world's palladium. The oil industry is also using more palladium for catalysts in oil refining.

Palladium, towards the end of 1980, was around U.S.$170-190 an ounce, compared to $600-650 for gold.

Platinum, however, has historically remained consistently higher in price than gold, but this has been reversed recently.

There is one very important development affecting gold. Until recent years, platinum was three to four times the price of gold, which was, in turn, usually close to the palladium price. Early in 1975, for the first time, the gold price pulled ahead of the platinum price and the palladium price has fallen to about one third of the gold price. Platinum no longer appears to be a candidate substitute for gold.

Few metal or alloy substitutes have all of gold's desirable properties and characteristics. However, in many industrial uses, electronics and the arts, platinum is regarded as technically superior to gold. In many electrical and electronic applications, palladium is considered the equal of gold; *the cheaper palladium is therefore likely to replace gold in a number of applications*. This in turn, would tend to further reduce the industrial demand for gold.

A further significant built-in advantage of palladium is that the specific gravity of palladium is lower than gold and, therefore, *less palladium by weight* would be required for such things as electrical contact points, compared to gold. In 1973, the free gold price began to leave the free palladium price well behind, and on November 18, 1974, even exceeded the free price of platinum for a time. Russia restricted sales of palladium during the first few months of 1975, but the price fell drastically to $43 per ounce by end—1975, (from the high of $150 reached in 1974). This, of course, helped to reduce Russia's earnings of hard currencies such as dollars.

In electroplating technology, palladium has not been used to any great extent in the past because most users were concentrating on seeking ways to reduce the content of gold, the traditional material.

Potential substitutes for gold (apart from price) are palladium and silver in electrical uses where substitution has been the most successful; transition metals in other uses.

There has been quite a switch from gold to palladium in dental uses in recent years.

Chapter 7

7.1 CONSUMPTION OF GOLD

7.1.1 WORLD

No official, comprehensive figures are published. Completely objective statistical studies on world gold consumption are very rare indeed. Although the industrial use of gold slowly rises and mine output falls, its monetary role appears to strengthen. However, the situation is *not* unlike silver, where world industrial consumption has long exceeded production, year after year, the gap having been filled by silver recovered from coinage and from above ground stocks. In the years 1976 and 1977, industrial demand for gold consumed *more* than the free world's mines produced.

All kinds of opinions and figures on world gold consumption are published, some of which appear to be inflated. Only the U.S. Bureau of Mines and the U.S. Treasury attempt to prepare and publish a government estimate, (for the U.S.A.), and the British firm, Consolidated Gold Fields Ltd., regularly attempts a world consumption review. Economists at Clark University, Worcester, Massachusetts, have done considerable research into world industrial consumption of gold.

The use of gold was down in 1980, particularly in jewellery, but the price of gold is on a rising trend because of investor demand.

Strong new bullish gold demand factors include:

1) Continuing inflation pressure worldwide.

2) Very high interest rates declining slightly.

3) Prospect of more oil price hikes.

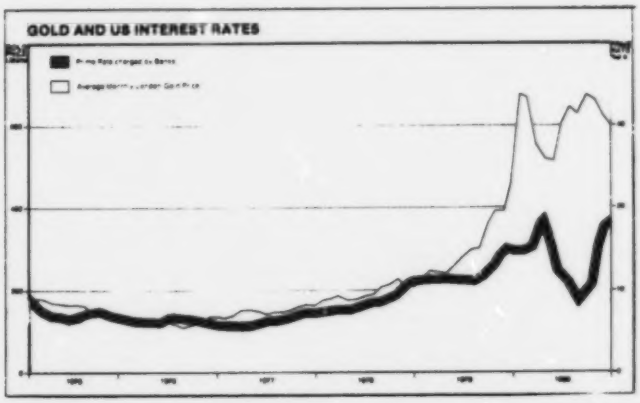
4) Buyers in Middle East and Far East diversifying heavily into gold.

5) Worldwide tendency towards asset diversification by major governments, banks, and individuals.

6) Continuing demand for gold coins.

7) Leading role played by gold futures contracts trading in determining the gold price level.

8) The fragile global political climate.



7.1.2 U.S.A.

U.S. domestic consumption of gold fell 37 per cent in 1980 to an estimated 93 metric tons, compared to 1979.

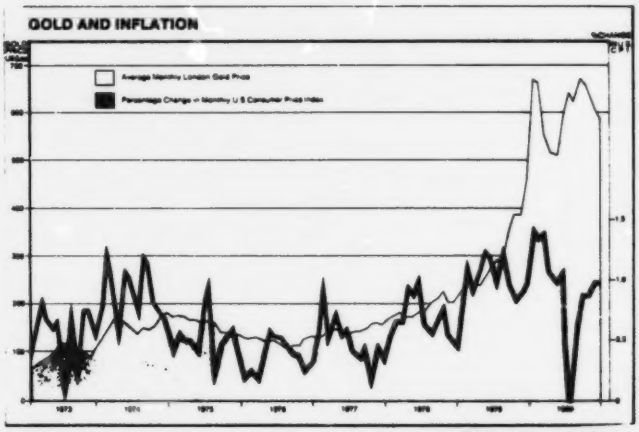
The U.S.A. is the largest "industrial" user of gold but it has only a small mine output. About 35 per cent of U.S. consumption is from scrap recovery.

Gold for industrial use in the U.S., rose dramatically, by nearly 80 per cent, during the period 1964-69, particularly in electroplating, electronics, aerospace, computer equipment, etc. Then came the U.S. recession of 1970 and in 1973, the oil crisis. Gold alloys and jewellery in the U.S.A. accounted for 87 per cent. U.S. consumption of gold in industry in 1972, including secondary, was 292 metric tons. "Secondary" recovery, (refining of gold scrap) in the U.S. in 1972 represented 26 per cent of consumption.

U.S. mine output of gold now covers only about 22 per cent of U.S. domestic industrial consumption of gold. The rest of the gold comes from secondary refining and from imports, largely of South African origin, although some is from Canada.

The U.S.A.—although very powerful—is no longer supreme in the world, either militarily or financially. It is glaringly dependent on certain imported metals and minerals—the most important suppliers being "inconvenient" countries such as South Africa and the Soviet Union. The U.S.S.R. is much more self-sufficient. (THIS SITUATION IS REVERSED IN THE CASE OF FOOD PRODUCTION.)

No U.S. duties are imposed on imports of unrefined gold or gold bullion into the U.S.A.



Chamber of Mines

7.1.3 JAPAN—GOLD MARKET

Japan has the industrial world's healthiest economy.

Japan has moved swiftly to take an increasingly prominent role in international gold markets since the recent progressive easing of official controls on the gold market in that country. The controls placed severe restrictions on gold dealing and gold holding of any sort by the Japanese public and virtually isolated that country from any significant participation in the gold market for more than 40 years.

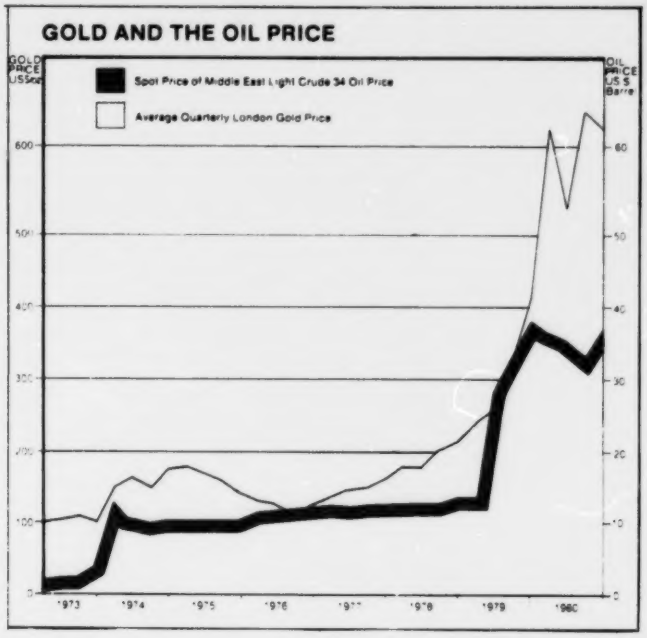
Total supplies of bullion to the Japanese market have increased substantially subsequent to the first stage of relaxation of controls six years ago and amounted to an estimated 162 metric tons in 1978, making Japan THE LARGEST SINGLE CONSUMER OF GOLD IN THE FAR EAST. Future demand is expected to strengthen with public interest in the metal stimulated in part by the Japanese Government, which is now considering a further liberalisation of controls that could pave the way for the creation of an official gold market in Japan.

Total gold supplies to the Japanese market in 1978 were made up of about 42 metric tons from Japan's refiners, 98 metric tons from direct imports, including jewellery and other gold items, and 21 metric tons from cycled gold. About 6 metric tons were exported so the actual domestic consumption last year amounted to about 155 metric tons.

It is also estimated that a large proportion, about 67 metric tons, of the gold supplied to Japan last year went into jewellery fabrication. A further 27 metric tons went to other industry applications, particularly electronics, and almost 15 metric tons were used in dentistry. About 41 metric tons were sold for investment and hoarding purposes.

7.1.4 SAUDI ARABIA

The Saudis have been large buyers of Italian jewellery.



7.2 MAIN USES OF GOLD AND ITS ALLOYS

More than 25 per cent of all gold used is said to be electro-deposited. World annual use for industry and the arts may top 1,450 metric tons. It could be higher in peak consumption years.

The Gold Institute of Washington, D.C. and Toronto, Canada is doing an outstanding job publicising the uses in which gold is consumed in industry and in the arts and in identifying and promoting new uses of gold.

7.3 COINS OF GOLD

Lydia was the first country to produce coined money, in electrum, a natural alloy of gold and silver, about 600 BC. The source of Lydia's gold was the river called Pactolus (now named Gediz or Sarabat). Lydia in Western Asia Minor, whose capital was Sardis, had always been productive and rich in gold. The Lydian king Croesus, who minted the first known gold coins, is still a symbol for immense wealth. (See chapter on Ancient Gold Sources.)

Shekel:

A Semitic unit of weight to measure gold and silver and later on a coin of that weight. Biblical references are to uncoined ingots. Abraham, around 1500 BC, paid 400 shekels to buy a burial site for his wife Sarah.

In Babylonia, small pieces of gold weighing 8.34 grams each were known as shekels centuries before the Lydian coins. The Mesopotamian shekel was 129 grains, based on the barley grain.

The Hebrew gold shekel weighed about 16.4 grams, each carrying a value of 13.33 silver to 1 of gold.

The alluvial gold of the Near East was usually electrum—a silver/gold alloy. Accepting a shekel was a gamble since the purity of the shekel (its gold content) varied from piece to piece. Pure gold was rare.

The shekel weight was one fiftieth or one sixtieth of a mina and one three thousandth of a talent. Word derived from Hebrew "sagal", weigh; Greek "siglos".

The new unit of currency in Israel (1980) is the sheqel, (about 25 U.S. cents in value).

Rome and Constantinople (Byzantium)

The Roman "solidus" coin—72 to the Roman pound of gold—also called "sextula" and "nomisma", was the Emperor Constantine's adaptation of Diocletian's reformed gold coin which had been struck at 60 to the pound of gold. It was accepted and became the "besant" of the Byzantine Empire. It contained 65 grains of gold. The basis of the financial system was the steady supply of a standard gold coin. It was accepted from China to Africa.

The "besant" was the gold coin of European trade for eight centuries, retaining its full value until Italian gold coinage was introduced in the 13th Century by Florence and Venice. In the 12th Century the besant was debased several times—initially by adding 25 per cent of base metals.

Italy

In 1252, Florence minted its first gold florin coin—named after the city. In the nineteenth century, Britain named its first "decimal" coinage piece, (one tenth of a pound, a two shilling coin) a "florin". "fl." is the abbreviation for the guilder in Holland.

7.3.1 MODERN GOLD BULLION-TYPE COINS

"Bullion-type" coins have been developed as an inexpensive, attractive solution to the problem of the small investor who wants to buy gold bullion, but balks at the high cost of a standard bar of 12.5 kilos (about a quarter of a million dollars), or even a 10 ounce bar costing over U.S.$6,000.

Some investors prefer minted gold to bar gold for a variety of reasons. Since most coins which are still circulating, and which once circulated as legal tender coins, are only available in limited numbers and therefore usually command high premiums above their gold value, they hardly qualify for investment purposes as gold metal. A number of countries however issue newly minted coins particularly suitable for investment as they sell at a premium of only a few percentage points above the gold bullion price. The prices of these coins then move in close relation to the gold price.

The bullion coin is struck in an easily understood weight, say 1 troy ounce, and has virtually no truly numismatic value and therefore the mark-up from the bullion prices is very small. The price of these coins moves in lock-step with that of bullion. These coins include facsimile "restrikes" by countries of old coins of one or two centuries ago such as the Austrian 100 Corona gold coin. They artfully combine the esthetic appeal of coins with a direct investment in gold.

The most popular gold bullion-type coins are the Canada "Maple Leaf", the South African Krugerrand, the Mexican 50 Peso and the Austrian Corona. They are very negotiable and are equally valuable investments.

80 nations issued legal tender gold bullion coins in 1979/1980.

Bullion in the form of gold bullion coins can be used to transfer wealth:

—to constitute a convenient way of transferring wealth in very portable form from place to place;

—to jump international currency barriers;

—without paying estates taxes.

i) CANADA

THE MAPLE LEAF GOLD COIN PROGRAM WAS LAUNCHED WITH THE PRIMARY PURPOSE OF STIMULATING GOLD MINING IN CANADA.

Canada, 50 Dollar "Maple Leaf"

The Royal Canadian Mint in Ottawa in 1979 commenced minting of this new legal tender coin, named after Canada's national symbol, the maple leaf. It bears a likeness of Queen Elizabeth II on the other side. Like the Krugerrand it contains exactly 1 oz. fine gold, but is furthermore distinguished by its fineness, (unusual for a coin), of 999/1000. Assays have shown that the actual purity is higher than that—making life difficult for counterfeiters. Diameter: 30 mm. IT IS NOW THE WORLD'S SECOND BEST SELLER AMONG GOLD BULLION COINS.

100 Dollar

The Royal Canadian Mint minted only 179,000 specimens of the 22 carat $100 Canadian gold piece in 1977. It contains half a troy ounce of fine gold and is struck in frosted proof condition. Total weight of the coin is 16.965 g of 916.7 fine gold, containing 15.551 g of gold, (about ½ troy ounce), (the balance, 8.34 per cent, is fine silver), and it is 27 mm. in diameter, 2.15 mm. thick. The coin was struck to commemorate the 25th anniversary of Queen Elizabeth's accession to the throne and bears her likeness. Sale price then was $140.00 each, ($280 per troy ounce), plus handling charges and sales tax.

Yes, the $100 face value coin contains only half an ounce of gold, but the $50 face value coin contains a full ounce of gold.

The Royal Canadian Mint reported that demand was heavy for its 1980 $100 22 carat gold proof coin commemorating the 100th. anniversiary of the transfer of the Arctic Islands from the United Kingdom to Canada. Output was to be limited to 300,000, (containing up to 5 tons of gold), but output may be much lower.

Gold mined in Ontario and the rest of Canada is used in making these coins. In 1977, Canada drew about two and a half metric tons of gold from its bullion reserves, (mostly acquired when gold was U.S.$35 an ounce), for the issue of these Canadian $100 legal tender gold coins, which took 2.75 metric tons of gold. About 35 metric tons of gold were used for these various coins in 1979 and about 35 tons in 1980.

The gold bullion in these coins comes from the current output of Canadian gold mines.

This means that, on average, there is more gold from Ontario in each coin than from any other province.

The $100 gold coin to be issued in the fall of 1981 has been selected to mark the approval of O Canada by Parliament as the country's official national anthem on July 1, 1980.

The reverse of the coin will depict a musical scroll with the first four notes of the national anthem, superimposed on a map of Canada. The words O Canada will appear below the design, which is the work of Nova Scotia artist Roger Savage. No stranger to coin design, Savage created the 1978 Unity gold coin which depicted the graceful flight of 12 Canada geese.

The coin, with the effigy of Queen Elizabeth on the obverse, will contain one-half ounce of gold, and will have a diameter of 27 mm. The coin, with an authorized mintage

of 250,000, will be available from September 1 to November 30, 1981.

It has been revealed that the mint has struck more than 1,762,000 $100 gold coins since 1976, and 2,215,000 one-ounce Maple Leaf gold coins since September 1979.

The sale of these gold coins yielded approximately $1.6 *b*illion, of which 80 per cent came from points outside Canada.

5 million Maple Leaf gold coins were to be minted over three years. The Royal Canadian Mint plans were to strike one million of the one-ounce coins in 1979, two million in 1980 and two million in 1981. The full issue of 1979 coins was sold out by December, 1979.

Canada's mine production of gold averages about 50 metric tons a year, so assuming that mine output does not rise in 1980 and 1981, any balance required by the Royal Canadian Mint will be released from Canada's government reserve.

The price of each coin is up to 7 or 8 per cent above the daily London fixing for gold bullion for the gold content, plus any federal, state, provincial or municipality taxes applicable. The Ontario sales tax is 7 per cent on the sales value.

Each 50 dollar coin costs about C$690 if bought in Ontario when gold bullion is around C$600 per troy ounce.

20 Dollar—Canada

Weight 18.2733 g, 900/1000 fine gold. Diameter: 27 mm. Pure gold content 0.5287 troy ounce.

About 10,000 metric tons of gold was used for coinage between 1823 and 1914, of which U.K. used 6,500 tons (over 90 million half sovereigns and 600 million sovereigns), U.S.A. 5,000 tons and France 3,500 tons.

Up to 1934, the U.S.A. had issued 88 million Double Eagle $20 gold coins, 56 million Eagles, $10 and 75 million half-eagles, $5.

CANADIAN GOLD COINS

Denomination	Date	Composition	Weight (g)	Diameter (mm)
5 dollars	1912-14	Gold 90 per cent, Copper 10 per cent	8.36	21.59
10 dollars	1912-14	same as above	17.72	26.92
20 dollars	1967	same as above	18.27	27.05
100 dollars −22 karat	1976	Gold 91.6 per cent Copper 8.4 per cent	16.96	24.49
−14 karat	1976	Gold 58.3 per cent Copper 31.3 per cent Silver 4.0 per cent Zinc 6.4 per cent	13.337	26.52
−22 Karat	1977 to present	Gold 91.6 per cent Silver 8.4 per cent	16.96	27.00
100 dollars	1978	National Unity strike		
100 dollars	1979	Year of the Child		
50 dollars	1979	"Maple Leaf", 1 troy ounce of .999 fine gold		
100 dollars	1980	Centennial of Canadian Sovereignty over the former British Arctic Territories		
100 dollars	1981	National Anthem Commemorative		

GOLD USED IN CERTAIN OFFICIAL COINS

Official Gold Coin Fabrication
By Country

(metric tons)

	1973	1974	1975	1976	1977	1978	1979	1980P
Market Economies								
South Africa	30.108	99.686	173.588	90.884	88.893	193.588	145.408	97.664
United Kingdom	.715	14.711	29.299	8.086	22.798	49.112	57.603	37.324
Mexico	12.005	66.685	9.890	14.494	.808	22.705	45.597	23.109
Canada	.995	.093	.311	11.103	2.985	4.603	34.991	37.324
Turkey	3.390	6.002	13.498	14.307	11.010	5.505	0	0
Austria	4.385	74.990	9.486	28.397	7.806	5.100	.404	.093
Switzerland	0	0	.808	3.390	5.007	1.213	.995	4.665
United States*	0	0	2.706	1.399	.995	.995	.995	31.103
Chile	0	1.990	1.492	3.608	.590	0	1.710	0
Other	2.706	5.909	10.015	9.517	5.412	4.696	1.804	0
Subtotal	54.306	270.071	251.098	185.190	146.310	287.520	289.511	231.285
USSR	0	0	1.959	7.775	15.551	6.842	11.819	******
China	0	0	0	0	0	0	.622	.622
Hungary	0	17.013	0	0	0	0	0	0
Subtotal	0	17.013	1.959	7.775	15.551	6.842	12.441	******
World Total	54.306	287.085	253.057	192.965	161.862	294.363	301.952	******

* Includes U.S. Gold Medallion Series

****** Not Available

P—Preliminary

Sources: 1973-79 Market Economies and Hungary—Consolidated Gold Fields
1973-79 USSR and China—J. Aron precious metals Research Dept.
1980P J. Aron precious metals research department

ii) United Kingdom—Sovereigns

The earliest coins found in Britain are not Roman but Celtic Gallo-Belgic issues, the earliest of which, a good copy of a gold stater, dates from about 100 B.C., long before the Romans came to stay.

The "sovereign", introduced in 1489, was the first gold coin that was officially equal to a pound sterling in value.

It weighed half an ounce, (compared to under a quarter of an ounce of gold contained now.)

A new gold coin was minted during the reign of Charles II in England, 1660-1685, called a "guinea", so called because the gold came from Guinea in Africa.

The sovereign was reintroduced in England in 1817 under King George III.

Genuine gold sovereign coins (one pound sterling face value) are 916.66 fine (91.666 per cent gold). This fineness can also be referred to as "22 karat" gold. The balance is copper. It weighs 7.98805 g. when new, (0.26 Troy ounce), and has a content of 0.235404 Troy ounce of gold. The gold in a sovereign is worth about U.S.$135 when the gold price is $600 an ounce. It measures 22.1 millimetres in diameter, 1.63 mm thickness, with a reeded (milled) edge. Sovereigns are dated from 1837 to 1925 and from 1957 to the present.

The gold sovereign is still trusted in the Near East, particularly in the Sudan and North Africa—also in Greece and Bulgaria. In the heyday of the British Empire, the British used large quantities of sovereigns to pay tribes to fight, to bribe rulers etc.

All the early oil revenues for Saudi Arabia had to be paid in gold sovereigns—just as T. E. Lawrence paid the Arab tribes to fight the Turks with sacks of gold sovereigns a few years before. In the war in Yemen, gold sovereigns were used by both sides to bribe and persuade tribes.

n.b. One out of every four of sovereigns on the market is counterfeit—either German, Lebanese, Syrian or Pakistani. Be warned.

It is a profitable business.

Most of the counterfeits are made in Lebanon and Syria. Almost all counterfeits are coins of Edward VII and George V—both bearded. Coins of George VI—unbearded—are not popular.

51 metric tons of gold were used to make sovereigns at the Royal Mint, London in 1979.

Half sovereigns weigh 3.9940 g, 916 2/3 /1000 fine gold. Diameter: 19 mm.

A sovereign or English one-pound piece, has a face value of 1 pound sterling, which in June, 1979 was worth only U.S.$2.11 in the currency market.

As recently as late 1970, one could buy a gold sovereign for U.S.$9.70 wholesale. The price in June, 1979 had reached about U.S.$75.00 for one sovereign. They are normally sold in lots of 100 coins or half lots of 50 coins.

The winner of North America's oldest stakes race, the Queen's Plate, (*Canada's* most important horse race), receives the traditional 50 gold sovereigns, a gift from Her Majesty, worth about $7,800 of gold contained when the price is $600 an ounce.

In June 1979 the new British Finance Minister said that the 1975 controls on gold coins would be abolished.

For the first time since the coronation of King George VI in 1937, the British government has produced in 1980 a four-piece gold proof set, and the issue is expected to be a complete sellout.

Each 1980 set includes four 22-carat gold coins in *five pound, two pound, sovereign* and *half sovereign* denominations. They have a combined weight of two ounces of pure gold.

Although legal tender in Great Britain, the coins contain far more in gold value than their worth as currency.

In this century, complete sets of the four British gold coins have been made on four occasions only. They are dated 1902, 1911, 1937 and 1953.

The mintage figure for the 1980 sets is a mere 10,000, of which some 2,000 have reportedly been allocated to the entire North American market.

The obverses of the coins feature the Arnold Machin portrait of the Queen. The reverses carry the famous portrayal by Benedetto Pistrucci of St. George slaying the dragon. The half-sovereign issue is the first to be produced in quantity since 1915.

By January, 1981, the value (purchasing power) of the English 1-pound note (bill)—made up of 100 new pence (p.)—had fallen to 29 p. compared to what it was worth when the "new" penny was introduced as a decimalisation measure only ten years ago in 1971. (Compare the 1960 U.S. dollar which was worth only 36 cents by January 1981.)

Now, the U.K. paper 1-pound note is to be replaced in 1983 by a "gold"-coloured base alloy coin. It is approximately the same size as the gold sovereign, 22 mm, 7/8 inch, but considerably thicker with a distinct security edge. The alloy will probably be Virenium, nickel-bearing, used for the popular golden-coloured 1978 Isle of Man 1-pound coin.

It is not known whether it will be called a sovereign. The usage life of a pound note had fallen to only nine months. Coins usually last 40 years.

The U.K. Treasury has confirmed that there will be no pressure on the Scottish and Irish banks to end their jealously guarded 1-pound note issues. The Isle of Man continues the half-pound note. Scotland is not allowed to issue coins. Most British coins are made in Wales by the Royal Mint.

Square Gold Coin

A new gold coin which is square in shape with rounded corners became available in 1981. It is a 1-pound sterling coin issued by the British Channel Island of Jersey. The name is a corruption of Caesarea. The coin contains about one-half of a Troy ounce of gold in a 22 karat alloy.

Jersey will issue a 2-pound legal tender coin in 22 karat gold to commemorate the wedding of Prince Charles and Lady Diana Spencer.

The new 1981 round 5-pound coin of the Isle of Man, available in 22 karat gold. Only 1,000 will be minted.

The Bailiwick of Guernsey (old name SARNIA) in the Channel Islands issued square 10 shilling (half pound) coins in 1966 in base metal. The round 1-pound coin was issued at the end of 1980.

iii) South Africa, 1 Krugerrand

This coin, first minted in 1967 on the basis of the Mint Law of 1964, was distinguished by the fact that it contains exactly 1 oz. fine gold, 33.1903 g, which facilitates comparison with the bar-gold price. Fineness: 916 2/3 / 1000. Diameter: 31 mm.

The South African Mint's "Krugerrand" gold coins are named after Stephanus Kruger, President of the Transvaal in the late 19th century, and have been a great success. The agio on these coins is not great, about 4 per cent or more of the total price, so they have proved to be a popular investment in countries where possession of gold bullion bars is illegal, such as the U.K. etc. 26.75 metric tons of gold in Krugerrands were sold all over the world in 1973 and about 100 metric tons in 1974. The minting rate went up to over 70,000 per week.

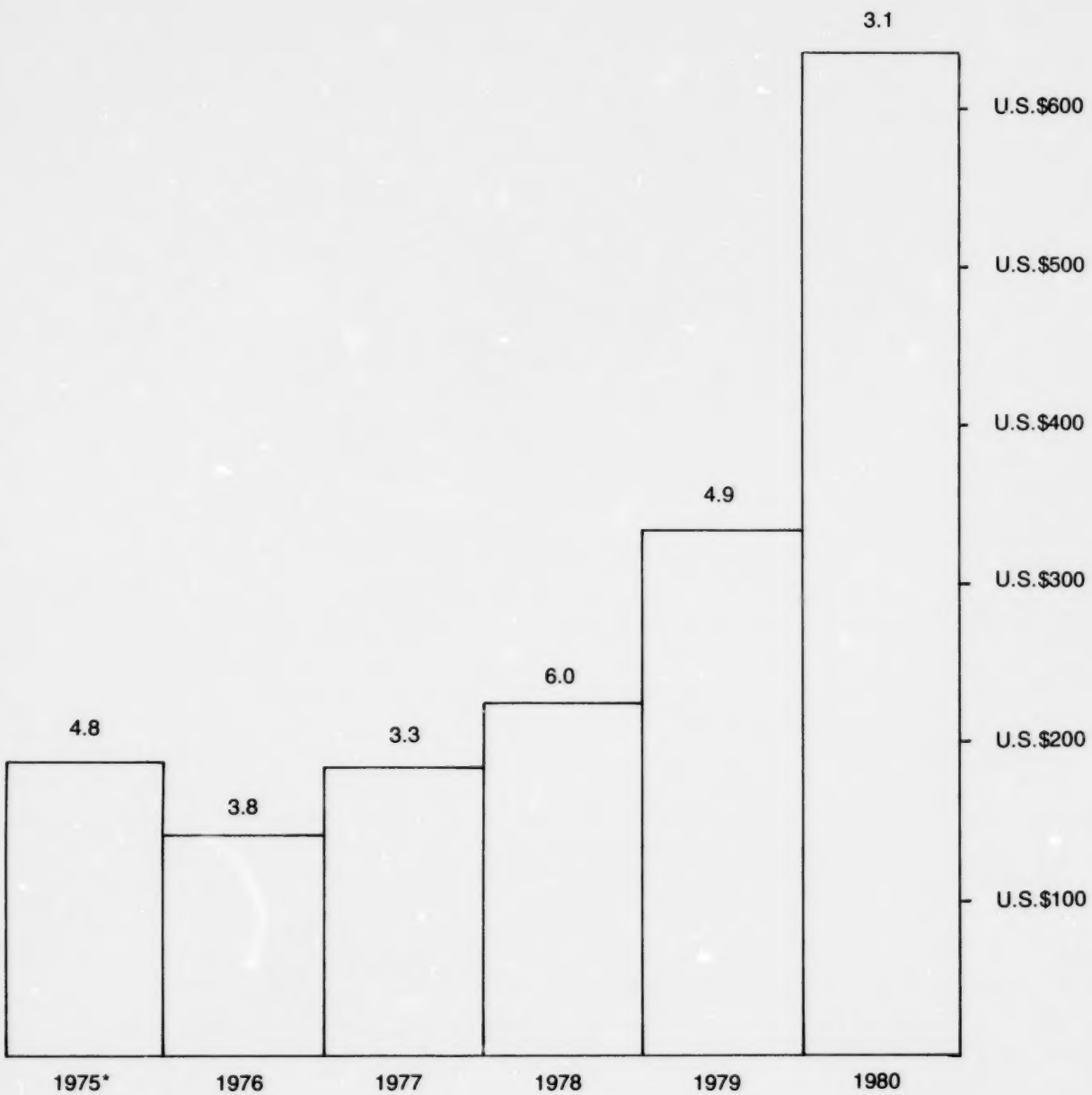
The South African Mint opened in 1923 as the Pretoria Branch of the Royal Mint (England) and became the South African Mint in 1941.

South African Krugerrand coin production took 190 metric tons of gold in 1978, but has been declining since, because of competition from the Canadian "Maple Leaf" coins and Mexican coins. Krugerrand output represented about two-thirds of new gold mintings globally in 1977.

4.94 million Krugerrand gold coins were sold in 1979, a 17.8 per cent decline vis-a-vis 1978, but the value of sales increased by 27 per cent to Rand 1,300 million.

Worldwide sales of 1-ounce Krugerrands, in millions

(figures above bars)



* Year Americans were permitted to buy gold bullion.

Source: South African Chamber of Mines

Krugerrand Coin Sales

Since its introduction, over 30 million Krugerrand gold coins have been sold for an estimated U.S.$16 *b*illion in value. Large scale advertising and promotional programs on Krugerrands by Intergold assisted in this rise.

In 1980, total sales of all Krugerrand gold coin denominations fell by 36 per cent.

September, 1980	144,607
October, 1980	315,882*
October 1979	103,835

* 309,692 were sold outside South Africa.

To broaden the market among smaller buyers, South Africa has started to mint and sell Krugerrands in denominations of 1/10, 1/4 and 1/2 of an ounce of gold.

A 1-kilogram, (about 2.2 pounds weight avoirdupois), solid gold medallion is to be produced in South Africa in February, 1981. It has been called the Kruger Kilo. Only 100 will be made. Sales price will be R30,000 each.

iv) U.S.A.

In 1978, the U.S. Congress passed a law requiring the Treasury to begin selling its own one troy ounce and a half-ounce gold pieces by Spring, 1980.

The U.S.A. took 30 tons of gold from government reserves to strike the new "medallions". These have not sold well.

Gold Medallions—U.S.A.

The United States Treasury announced in July, 1980 that it would offer, (in competition with South African Krugerrands and Canadian Maple Leafs), two medallions at market prices: a Grant Wood one-ounce for US$645, a Marian Anderson half-ounce for US$322.50.

It was the first time since 1933 that U.S. Government gold was made available to small investors. The U.S. Government added that it would issue two new medallions each year for five years. The sales quota set was a minimum of a million troy ounces a year. A deadline of August 30, 1980 was set to end the first year's sale.

The sale was not ended until February 28, 1981 and then the quota was not met. The U.S. Mint sold about 435,000 troy ounces of gold at a little better than U.S.$600 an ounce. About a third of the sales were in the first three weeks and they then settled down to a fairly low level.

It was profitable, however. The Mint deposited more than a quarter of a billion dollars in the general fund of the Treasury. Most of the gold had been bought by the Government at a little below U.S. $35 an ounce.

There is a strong feeling that if the gold medallions had been U.S. coins, (legal tender or coin of the realm), they would have sold like hotcakes.

U.S. purchases of gold bullion and gold coins rose from 43 per cent of the world total in 1976 to 53 per cent in 1978.

In 1978, Americans bought 5.16 million troy ounces in gold bars, compared with only 268,000 ounces in 1977.

A large percentage of coins such as the U.S. 20-dollar Double Eages (and Britain's sovereigns) that are around today are actually counterfeit.

U.S. citizens were prevented legally for more than 42 years—almost half a century—from owning gold bullion, through the second last day of 1974.

The U.S.A.'s sources of imported gold, 1974 through 1977, were dominated by Canada, 44 per cent, although a lot of this was South African gold in transit or on consignment.

v) Austria, 100 Kronen (Corona)

New strikes by the Austrian mint of a legal tender coin struck between 1909 and 1915 with a portrait of the Emperor Franz Josef. Fine weight of gold contained: 30.4878 g, fineness 900/1000. Diameter: 37 mm.

The Austrian 100-Corona gold piece contains less than an ounce, (0.9804 troy ounce), of gold and is in some ways "a better buy" because it usually sells at a premium of only 3 per cent over its gold content.

vi) Australia

The Royal Australian Mint in Canberra has produced Australia's first gold coin. It is known as the "Koala" because it carries the likeness of that charming bear-like animal. Its face value is A$200. It contains 10 g of 0.916 fine gold, about one third of an ounce, and measures approximately 24 mm. in diameter.

A considerable volume of orders has been received for the new Australian gold coin and the banks have ceased to accept additional orders. Orders for the proof version went well beyond the Royal Australian Mint's capacity.

vii) Mexico, 50 Pesos, "Centenario"

Governmental official new restrikes by the Casa de Moneda (Mexican Mint) of a legal tender coin minted first in 1921 on occasion of the 100th anniversary of Mexican independence. Fine weight of gold: 37.5 g, (1.2057 troy ounces of gold contained), fineness 900/1000. Diameter: 37 mm.

It is the *heaviest* of all the high circulation gold bullion coins in the world. (Argentinians are heavy buyers.)

"Azteca" 20 Pesos

Gold content: 0.4823 troy ounce of gold.

About 46 metric tons of gold were used for minting these two coins in 1979.

viii) U.S.S.R.—Gold Coins

Soviet Union, 10 Rouble, "Chervonetz"

This was the name of the gold coin minted in 1701 by Tsar Peter the Great. The 10 rouble coin issued since 1975 in fair

numbers is a new strike with the legal tender value of the first coins struck after the Russian revolution in 1923 and 1925. Fine weight of gold contained: 7.74234 g., fineness: 900/1000. Diameter: 22.6 mm.

The Soviet Union increased its production of Chervonetz gold coins 185 per cent in 1979 to 1 million coins.

The U.S.S.R. produced gold coins and medals—including several versions in both brilliant uncirculated (BU) and proof qualities with a Leningrad mintmark—or one from Moscow's Goznak Mint—in advance of the 1980 Olympics in the Soviet Union.

Russia is the only country to have issued solid platinum coins, 3, 6 and 12 roubles, in the period 1828-45, following discovery of platinum in osmiridium deposits in the Urals in 1819. Between 1828 and 1845, a total of 14.6 metric tons of platinum in coins were minted, with a total face value of 4 million roubles, but were all withdrawn from circulation in 1846. Public acceptance was poor. Gold coins were what people wanted. There was greater acceptance of and strong preference for gold coins in those days. Some platinum coins were illegally plated with gold and they were passed as gold coins quite easily because platinum and gold are almost identical in weight.

In the Middle East today, skilled minters still quietly turn gold into 15-rouble Tsar Nicholas II gold coins, which are later smuggled via Armenia etc. into the Soviet Union. Perhaps these are paid for with U.S. dollars accruing from black market operations in certain large Soviet cities. There is a small Middle East demand for 10 and 20 rouble gold coins, especially from Iran.

ix) China

China issued gold commemorative coins for its 30th anniversary on October 1, 1979, for sale all round the world. Four Chinese sites are depicted on the coins. They are the first gold coins to be struck since the Communists came to power in 1949.

Hong Kong $1,000 gold coin, Year of the Goat, (or Ram)
—each 15.98 g; 22k gold; contains under ½ounce of gold

The government of Hong Kong has produced a new HK$1,000 gold coin to commemorate the Chinese lunar year of the cockerel. The 22-karat gold coin is being struck by the British Royal Mint in Llantrisant, Wales. It is one in a series depicting the 12 animals of the ancient Chinese lunar cycle.

The Chinese calendar is based on a 12-year cycle, each year being represented by a different animal. February 5, 1981 marked the beginning of the year of the cockerel (or rooster), which ends on January 24, 1982.

Each coin measures 28.4 mm. in diameter and weighs 15.98 g. The pure gold content is slightly less than one-half ounce. The coins are legal tender in Hong Kong, with a face value of HK$1,000, or about $228 Canadian.

The British Royal Mint is striking the coins in both proof and uncirculated condition. The proofs are priced at $820 (Canadian) while the uncirculated versions are offered at $548, representing a substantial increase over last year's prices of $610 and $410 respectively.

The 1981 edition has a maximum mintage of 22,000 proof and 33,000 uncirculated.

The design on the reverse is based on an artist's conception of a cockerel which is regarded by the Chinese as highly virtuous. They believe the cockerel symbolizes culture, strength, bravery, love and faithfulness, and that people born during this year will possess these characteristics.

The obverse of the rooster coin will carry the portrait of the Queen used on most Commonwealth coins.

x) Fake Coins and Rings

Fake or Forged coins are totally genuine, except that they are not struck at the original government mint of issue. They are facsimile imitations with the correct mass of gold and are of the correct fineness of gold. The unauthorized maker gets his profit from the formidable price differential between the market value of the official gold bullion coins and the market value of the gold contained in them. The "fake" coin circulates just as easily as the genuine one in the Near and Far East.

The practice of fabricating facsimiles of well known and accepted official gold coins of the Western World as a method of overcoming restrictions on the private ownership of gold in many parts of the world has diminished rapidly in the past few years, firstly as a result of the removal of restrictions on gold ownership in some countries and, secondly, as a result of increased production of official gold bullion coins. However, the production of counterfeit Russian gold coins should continue owing to the unique situation in the U.S.S.R.

The discovery of hundreds of thousands of dollars worth of fake gold Krugerrands was reported in Texas in March, 1981.

In North America, there are *new fakes—not* counterfeits with the same gold content as the originals. The new fakes are rings made of a pewter compound, electroplated with gold and stamped with a false karat content. Pewter is a base metal alloy of tin hardened with copper and antimony and usually contains lead. Gullible and unsuspecting buyers of class rings etc. should go back to their Latin; "caveat emptor", let the buyer beware.

Other Countries

Cyprus, Singapore and other countries have issued official gold coins during the last few years.

Panama $100 gold Balboa Coin, (legal tender)

7.4 JEWELLERY

(Karat Golds—see Appendix III, the Language of Gold, Glossary)

Nearly 60 per cent of the gold which the mines sell to industry ultimately becomes jewellery.

Western Europe uses far more gold for jewellery than any other region in the world, (1977).

Western Europe ...	404	metric tons	(13 mill. ounces)
Middle East	249	metric tons	(8 mill. ounces)
Far East	109	metric tons	(3.5 mill. ounces)
North America ..... (U.S.A., Canada, Mexico)	106	metric tons	(3.4 mill. ounces)
Total Free World ..	980	metric tons	(31.5 mill. ounces)

Italy is easily the largest producer of gold jewellery in the world. U.S. citizens purchase a lot of this output.

Wild swings in the price of gold in 1980 dealt a harsh blow to Italy's gold jewellery industry, the world's biggest. Italian artisans and jewellery factories produced nearly one-third of the world's gold jewellery output in 1979 but they suffered from a slump in sales in 1980 because of high prices. There were predictions that the country's gold jewellery exports could fall by half in 1980 and domestic sales by one-third. To combat falling sales, manufacturers are making lighter and smaller articles, and in some cases cutting the gold content of their products.

India is the largest such producer in Asia. Europe supplies an important part of the increased demand from the Middle East, where high karat jewellery is greatly favoured.

World jewellery demand remained firm in 1977 and 1978.

Over the long term, the popularity of gold in jewellery should steadily increase.

Nearly all of U.S. jewellery manufacturing is centred in New York City and Providence, Rhode Island.

7.4.1 THE QUEEN'S WEDDING RING

The wedding rings of the Queen, Queen Elizabeth the Queen Mother, Princess Anne and Princess Margaret were all made from Welsh gold mined at The Clogan St. David gold mine at Bont-ddu, Merioneth, Gwynedd, Wales. It is a slightly darker shade than ordinary gold.

The Romans mined gold south of there at Dolau Cothi, between Llanio and Llandovery, Dyfed, (Northeastern Carmarthenshire), in southwest Wales. Dyfed derives from the Demetae, the Celtic tribe of that area. This deposit was also worked in the 19th and early 20th centuries. A little known 11 km. aqueduct, carefully engineered by the Romans to take water, (3 million gallons a day), from the River Cothi to collecting basins or tanks on the hill slopes above the gold mine can still be clearly traced. An exhibition of the Roman gold mine is at the museum of Abergwili, near Carmarthen. One may picnic close to the mine at Pumpsaint village. Waymarked trails start at Ogofau Lodge on the Cwrt y Cadno road. The mines were imperial, i.e. state, property.

The Princess of Wales—Prince Charles' Bride's Wedding Ring

Early in 1981, the press reported that the royal jewellers are preparing to fashion the wedding ring for Prince Charles' bride to be, the Lady Diana Spencer.

Miners at Bont-ddu are reported to have found enough gold to make the wedding ring. The wedding will take place on July 29, 1981, when the Lady Diana becomes the Princess of Wales, the first since 1910. It is the first time in 300 years that the heir to the British throne has chosen an Englishwoman. If Prince Charles succeeds to the throne, she will become Queen Diana.

7.5 WHITE GOLD

Palladium forms a silver white alloy with gold. Fortunately, the cheaper metal palladium is a more effective whitener of gold than expensive platinum. "White gold" in jewellery contains either 12% palladium or 15% nickel. The palladium-gold alloy is ductile and easily worked, in contrast to the cheaper nickel-gold alloy.

White gold alloys were originally developed as (cheaper) substitutes for platinum. White gold looks something like platinum but is much cheaper. (It may be considered to be the poor woman's platinum.)

Rings of White Gold—Rhodium plated

Rhodium plating can be successfully applied to low-carat white gold rings which are high in silver content and which contain little or no nickel. They are much less sensitive to local corrosion, (caused for example by perspiration from the hands), after being rhodium plated.

On yellow gold engagement rings with one diamond, the claws or prongs that hold the gem are often rhodium plated to highlight the whiteness of the diamond.

Rhodium plating is an important use because its surface is hard and brilliant. A tarnish resistant electro-deposited rhodium coating is used on white gold jewellery and costume jewellery and on silverware and searchlight reflectors of high reflectivity. It is sometimes used instead of much cheaper silver in putting a reflecting layer on a mirror, since rhodium does not tarnish.

Coloured Golds

A predominant amount of silver, or 15% nickel or zinc, or 10-20%, but usually 12% of palladium in the alloy is used to produce *white gold*.

White gold is made as a setting for diamonds because it looks like platinum, but is much cheaper. One alloy is 18 karat white gold (75% gold, 17.8% nickel, 5.47% zinc and 2.23% copper). The nickel addition gives the white colour.

A white gold article like a ring may actually be more valuable than one of regulation gold, depending on the alloy chosen and the cost of the labour involved. The range of colours can run from pale green to red. Gold's natural *"yellow"* is retained in an alloy with copper and silver. Copper gives a *pink* or *red* tint. A *rose* colour is produced by 75% gold, 5% silver and 20% copper. Gold with 25% silver, or a proportion of zinc and cadmium, results in a *greenish* tint. A *pale green* alloy is 75% gold, 22.5% silver and 2.5% copper. Iron gives gold a *bluish* tint. A gold alloy of 20% aluminum gives a fine *purple* alloy. Various percentages of metals such as zinc, cobalt, etc. also affect the colour and physical characteristics of the karat gold.

South Americans seem to prefer red golds, while many Europeans go for the lighter colour golds. The U.S.A., West Germany and the Arab world prefer yellow gold. The Japanese prefer white gold. Pink, white and yellow gold chains woven into a single necklace have attracted attention.

Impurities

Jeweller-manufacturers prefer to start with gold that is as pure as possible when preparing jewellery alloys. Osmium, one of the expensive platinum group metals, is an impurity which is particularly disliked—even in minute quantities within the gold. In a jewellery's gold alloy, a tiny speck of osmium might streak the highly polished surface of a fine piece of gold work.

Suggestions Box—Recognition

Suggestions by individuals for improvements in plants in industry, mines and in governments are often recognized by the award of a karat gold ring.

Firms such as Bank of America, Blue Shield, Oldsmobile, Yamaha and Sony use such rings as corporate awards for suggestions used.

Northern Natural Gas had suggestions which saved the company over 1 million dollars in one year and it regularly awards such rings in recognition.

7.6 DECORATIVE

Pure gold metal leaf is used as a decorative or protective coating on ceramic ware, leather, metal and wood.

Rhodium is essential in small amounts in the manufacture of "liquid gold", used to decorate glass ware.

In textiles, of course, pure gold thread has been used for many thousands of years.

Gold coins are frequently used for ornamental purposes in the Near and Far East—one item popular in the Persian Gulf is a bracelet containing 24 half-sovereign gold coins.

India takes gold more seriously than any other country except perhaps France. Gold is sacred in the Hindu religion. In India, gold is not something distant and associated with unreachable wealth. Possession of gold is especially concentrated among the rural poor. Even a beggar would likely keep some gold as a last reserve for when he is starving. In particular, gold is women's wealth because of her lack of inheritance or property rights under traditional Hindu law. It would be very unusual for any bride to receive a dowry of less than one ounce of gold. Gold in India is mostly of 22 karat quality.

7.7 HALLMARKS AND STANDARDS

In Canada, the Precious Metals Marking Act applies. The Canadian market for jewellery and silverware was $616 million in 1977. The value of illegal precious metals and smuggled into Canada each year is estimated at between $200 million and $400 million. There is a 10 per cent Federal excise tax on imported precious metals, as well as 25 per cent Federal import duties on finished products and 17 per cent Federal import duties on semi-finished products and a 9 per cent Federal sales tax. The strong incentive to avoid paying these millions of dollars of taxes and duties makes smuggling highly profitable. The Canadian Jwellery Association estimates that the Federal government loses $98 million in revenue for every $100 million in such illegal goods coming into Canada.

Since Canada is one of the top three mine producers of gold, platinum and silver in the world, there is an element of irony in all this. As a statistical average, it might be argued that a certain proportion of the gold, platinum or silver content of the jewellery coming into Canada could be Canadian-mined precious metal originally exported in primary form which is coming back to Canada as jewellery.

The CJA urged the dropping of the 10 per cent Federal excise tax—thereby reducing the incentive to smuggle and increasing the gross amount of tax revenue collected.

GOLD USE IN ELECTRONICS (METRIC TONS)

Country	1970	1971	1972	1973	1974	1975
United States	44.8	42.8	51.2	61.6	44.0	20.4
Japan	18.1	20.1	22.5	26.0	15.0	17.1
W. Germany	10.0	8.0	11.0	15.0	12.0	8.0
France	4.5	4.0	4.5	5.0	5.5	4.5
United Kingdom	5.8	4.0	5.0	5.5	4.4	3.6
Switzerland	0.9	1.0	1.5	3.0	3.0	2.5
Italy	1.5	1.6	5.0	5.0	2.0	1.9
Yugoslavia	—	—	—	—	2.0	1.7
Netherlands	1.1	1.3	1.4	1.6	1.5	1.0
Canada	0.5	0.7	0.8	1.1	0.9	1.0
Korea	—	—	0.2	0.2	0.5	1.0
Spain	0.7	0.8	0.8	0.6	0.6	0.7
Australia	0.4	0.6	0.5	0.6	0.5	0.5
Austria	1.0	0.8	0.8	0.5	0.5	0.4
Brazil	1.5	1.8	1.5	0.3	0.3	0.4
Singapore	—	—	0.3	0.8	0.3	0.3
India	—	—	0.1	0.1	0.2	0.2
Belgium	0.7	0.8	0.9	1.0	0.9	—
Total	91.5	88.3	108.0	127.9	94.1	65.2

As might be expected, the demand for gold for the fabrication of electronic equipment is confined largely to developed countries, with the United States, Japan and West Germany being the largest consumers.

Source: W. S. Rapson and T. Groenewald

7.8 ELECTRONICS

The electronics and related uses of gold, (if the price does not go too high), may be expected to grow, because it is almost the least corrosive metal, with high conductivity. One of the very few compounds which can attack gold is aqua regia (3HC1-1 HN03).

In spite of the much higher price, the use of gold in the electronic and communications industry is rising.

INSTRUMENTAL APPLICATIONS OF GOLD AND GOLD ALLOYS

A wide range of instruments use gold and gold alloys because of their electrical resistivity or conductivity, contact resistance, temperature coefficient of resistance, thermal emf against copper, mechanical strength, malleability, resistance to wear, low coefficient of friction, thermal conductivity ensuring rapid dissipation of heat and resistance to tarnish and corrosion.

Gold in conductors and contacts is the most important use of gold in industry:

—fine wires or surface coatings in electronic circuitry;

—separable contacts for low and medium energy circuits;

—relay make-break contacts;

—wipers for potentiometer wires and connectors

World use of gold for electrical contacts in 1973 was estimated at over 100 tons.

GOLD USE IN DENTISTRY (Metric tons)

Country	1970	1971	1972	1973	1974	1975
United States	20.4	23.3	23.3	21.1	16.5	18.5
Germany	8.5	9.0	11.0	12.0	10.0	12.0
Japan	9.6	10.0	10.3	12.5	10.0	10.0
France	6.0	6.5	7.0	7.0	6.0	5.0
Switzerland	1.3	1.3	1.4	4.0	4.0	3.8
Italy	4.0	4.5	5.0	5.5	4.0	3.5
Sweden	1.2	0.9	0.8	0.7	1.3	1.3
Israel	—	—	—	1.0	1.3	1.3
Spain	1.2	1.2	1.3	0.8	0.8	1.2
Brazil	1.0	1.0	1.0	1.0	1.0	1.1
Greece	1.3	1.0	1.0	0.9	0.8	1.0
Mexico	1.3	1.7	2.1	1.8	0.5	1.0
Yugoslavia	—	—	—	—	1.1	1.0
Austria	0.9	1.1	1.2	0.9	0.8	0.9
Netherlands	0.9	0.9	1.1	0.9	0.8	0.8
United Kingdom	1.0	0.8	0.8	0.7	0.6	0.8
Australia	0.5	0.6	0.6	0.6	0.5	0.5
Belgium	1.2	1.3	1.3	0.3	0.4	0.4
Canada	0.7	0.6	0.5	0.5	0.3	0.3
Denmark	0.1	0.1	0.1	0.1	0.1	0.1
Norway	0.2	0.2	0.2	0.2	0.1	0.1
Venezuela	0.4	0.4	0.3	0.2	0.1	0.1
Peru	0.2	0.2	0.2	0.1	0.1	0.1
South Africa	—	—	0.2	0.1	0.1	0.1
Portugal	0.1	0.1	0.1	0.1	0.1	0.1
Turkey	—	1.0	0.5	—	—	—
Egypt	0.1	0.1	0.1	—	—	—
Argentina	0.5	0.3	—	—	—	—
Chile	0.2	0.2	—	—	—	—
Columbia	0.2	0.2	—	—	—	—
Total	63.0	68.5	71.4	73.0	61.3	65.0

Source: W. S. Rapson and T. Groenewald

7.9 MEDICAL AND DENTAL USES

Dental and medical uses could more than double in twenty years.

Medicine—The Use of Gold

Gold has been used in medicine empirically since ancient times. However, in 1890, the bacteriostatic action of gold cyanide and gold chloride on tubercle bacilli was described, as well as the effects of gold in various forms on other organisms. From 1913, a number of thio-compounds of gold were applied by injection in a range of conditions other than tuberculosis.

Gold has restricted but important uses in medicine. A radioactive isotope of gold is used in the form of implants known as gold grains as a source of gamma or X-ray radiation for the treatment of malignant growths. In colloidal form radioactive gold is employed for delineating the lungs and liver. The radiation from radioactive colloidal gold introduced into these organs makes it possible to define their positions in what is known as scintography.

Rheumatoid Arthritis

The major modern therapeutic use of gold is in the treatment of rheumatoid arthritis with sodium aurothiomalate and aurothioglucose. One statistic is that in 1970, 17,000 prescriptions for sodium aurothiomalate were issued in the U.K. The efficacy of gold therapy has been established in a series of controlled trials, (Empire Rheumatism Council Research Sub-Committee, Gold Therapy in rheumatoid arthritis. Final result of a multi-centre controlled trial; Fraser, T. N., Gold treatment in rheumatoid arthritis American Rheumatism Association, A controlled trial of gold salt therapy; Sigler, J. W. et al., Gold salts in the treatment of rheumatoid arthritis. A double-blind study). There appears little doubt that gold is one of the few drugs which can alter the course of the disease, (Constable, T. J. et al., Drug treatment of rheumatoid arthritis, Lancet, May, 1975).

In October, 1979, A. Lorber and T. M. Simon published a summary, "Applications and Implications of Gold Therapy", highlighting recent advances in biological, chemical and medical disciplines on this use of gold.

Gold therapy is one of the very few methods known by which positive results can be achieved in the treatment of rheumatoid arthritis. The risks of toxic effects are such, however, that such treatment must still be very carefully controlled.

Gold is also used in radiation or X-ray treatment, where internal barriers of solid gold are employed to protect vital organs.

Gold is implanted as a tiny weight to replace the action of muscles which have ceased to work due either to illness or accident. A patient with paralyzed eye muscles recovers the vital ability to doze or open the eye and to blink.

Dental Golds

Gold is the metal most favoured in dentistry because it is more bio-compatible (less harmful to the body) than other metals.

Gold for dental work is actually high purity gold, used in various forms such as foil, powder or mat gold, (which comprises thin, flake-like dendritic crystals), as well as in wrought alloy wires, plates and alloy solders, plus two varieties of casting alloys. The pure dental golds are in a state in which they readily undergo cold bonding in fillings of low or medium stress. Platinum-centred sandwich gold foil provides stronger fillings but it is harder to work with. Palladium and platinum are added to gold-based dental alloys in amounts up to 12 per cent. The colour is lightened and corrosion resistance improved. The palladium content may range from 2 per cent in yellow gold alloys to 40 per cent in white gold. Palladium-rich alloys are also used as supports in porcelain overlay bridgework.

About 10 tons of the gold attributed to "jewellery" usage in developing countries is probably used in "dental" applications.

7.10 NITRIC ACID PRODUCTION

A successful West German invention in gold/palladium alloy woven wire catchment gauzes for nitric acid plants increases the secondary recovery of both platinum and rhodium.

7.11 RAYON AND SYNTHETIC THREAD MANUFACTURE

Platinum is used to form spinnerets or plates perforated with thousands of microscopic holes, or orifices, (which must retain size and alignment), through which rayon or other man-made materials are extruded very hot and very fast as strings to form the threads or filaments, which are then spooled and woven into the various synthetic fabrics. Spinnerets for making such viscose fibres are either of a 10 per cent rhodium alloy or one of 30 per cent platinum/70 per cent gold, which is used in rayon manufacture. A spinneret may have as many as 25,000 tiny holes.

7.12 TELEVISION SELECTOR

A platinum-gold-silver alloy is used as a surfacing on television channel selector contact springs.

7.13 GOLD IN WINDOW GLASS

Overheating of offices and an increased load on air conditioning occurs in many modern buildings with large window areas when ordinary window glass is used.

Gold-coated window glass reduces these problems, screening off infra-red radiation. In double glazed windows, the heat reflecting gold film is applied to the inner surface of the outer glass. This fends off about 74 per cent of the solar radiation. Increasingly, the gold is sandwiched between two dielectric layers. In some windows, gold alloys are used.

The Rolls Royce Bristol jet engines in the supersonic Concorde airliner have exhausts that are gold plated, making a very effective space heat reflector.

Salami

Gold's unparalleled ability to reflect heat was dramatically shown when a New York U.S. Customs officer one particularly hot day noticed that a salami sausage belonging to a passenger did not sweat as much as it should have done. On examination, the sausage was found to contain 60 per cent gold.

7.14 SOLAR CELLS

Sunlight striking the surface of silicon solar cells generates a small electric current. The best way to collect the current from each cell is by way of gold plated conductor grids deposited on the silicon cell surface.

7.15 FUEL CELLS USING GOLD

Gold alloys have been used in fuel cell electrode research, because of corrosion resistance, hydrogen permeability in membrane electrodes and in catalytic materials.

7.16 ALLOYS FOR BRAZING AND SOLDERING

These bonding aids comprise a range of gold alloys, (gold-copper, gold-silver, gold-silver-copper, gold-nickel, gold palladium etc.).

Gold solders join turbine blades to rotors in jet engines in aircraft.

7.17 CATALYSTS

A rhenium-gold alloy reforming catalyst for gasoline refining was disclosed by Exxon Research.

7.18 SUMMARY OF SOME OTHER USES OF GOLD

Application	Forms and Alloy Additions
Electrical Contacts	Platinum, Unalloyed; other platinum metals; *Gold*; Copper.
	Palladium, Unalloyed; electro-deposited other platinum metals; *Gold*; Copper; Silver.
Potentiometer Windings	Platinum; Rhodium; Copper; Iridium; *Gold*.
Scientific and Laboratory Equipment Platinum laboratory ware and electrodes in high temperature furnaces	Platinum, Unalloyed; Rhodium; Iridium; *Gold*.
Temperature-Limited Fuses	Palladium; *Gold* and Platinum
Thermocouples	Iridium; Palladium, Unalloyed; *Gold*.
Mainly for the steel industry to take dip temperature measurements, (to measure high temperatures in the control of industrial processes)	
Dental Applications	Palladium, Unalloyed; Copper; Silver; Platinum; *Gold*.

7.19 CUTTING DOWN ON THE USE OF GOLD

Higher gold prices are causing manufacturers to look for ways to use less gold.

A prime example has been developed by the Western Electric/Bell Laboratories organization in the U.S.A.

The totally new (1979) Western Electric process for the electro-depositing of gold in switching components used in the Bell Telephone System of transmission uses 55 per cent less gold than the former process. Western Electric had saved 3,000 pounds (1.36 metric ton) of gold and about U.S.$9 million with the new process by mid-1979.

7.20 FABRICATION OF GOLD FOR INDUSTRIAL AND COMMERCIAL USES DURING THE PERIOD 1968 TO 1980

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979e	1980e
Total fabrication, metric tons	1221	1197	1272	1383	1341	854	729	973	1380	1405	1552	992	755
of which													
Karat jewellery, metric tons	912	904	1062	1060	996	512	220	519	931	996	1001	737	550
Electronics, tons	82	100	89	86	105	127	92	67	76	77	85		
Dentistry, tons	60	60	59	63	66	68	57	62	76	82	87		
Other industrial/decorative uses, tons	58	63	62	69	71	72	67	60	66	67	75		
Medals, medallions and fake coins, tons	40	44	54	52	41	21	7	21	47	47	46)	323	210
Official coins, tons	68	26	46	54	63	54	287	244	184	137	259)		
Total fabrication as percentage of net private bullion purchases*, per cent	67	104**	133**	100	108**	61	59	88	96	86	89		
Average gold price, U.S.$/oz.	$38.6	41.1	35.9	40.8	58.1	97.2	159.1	161.1	124.8	147.7	193.3		
Average gold price, 1978 U.S.$/oz.	$72.3	73.1	60.4	65.8	90.7	142.7	210.8	195.2	143.2	159.2	193.3		

* The balance of net private purchases represents gold bought in bullion form for investment purposes. This residual also includes stock changes and errors and omissions.

** In 1969, 1970 and 1972 there were substantial net sales from private investment stocks of gold. Net private purchases (including those for investment) were consequently less than total fabrication.

Source: Mining Survey; Credit Suisse

7.21 THE MONETARY ROLE OF GOLD—GOLD AS MONEY

Gold is, has been, and probably always will be the ultimate store of wealth. It has been extremely valuable for 6,000 years at least. For thousands of years gold has been used for coinage and trade and more recently as backing for paper currency. The pro and con arguments on gold's monetary role will probably continue until Domesday. The main argument in its support is that ultimately gold serves best as a measure for final settlement.

To many people, (particularly in Western Europe, Southeastern Europe and the Middle and Far East), gold is "hard money" and far superior to printed paper called dollar bills, pound notes etc. For centuries, the standard of value par excellence has been gold.

GOLD NEEDS NOBODY'S SIGNATURE TO MAKE IT VALUABLE. This needs to be emphasized over and over again.

In the age-old conflict between gold as money and paper or credit-debt as money, history shows that gold has been the long term winner. To give only *one* example, for about 800 years the Byzantine Empire's gold coin, the "bezant", was the solid monetary basis for the known world's trade. However, when Alexius Comnenus reduced the gold content, the Byzantine Empire declined and was eventually engulfed. Gold then became the unit of the Renaissance in Western European countries.

Gold remains quite simply the "numeraire" or measuring stick for all man-made currencies.

Gold is universally accepted as value. Gold is the one universally accepted currency, in effect. In the last resort, gold is money. The Austrian economist, Schumpeter, has said that "THE MODERN MIND DISLIKES GOLD BECAUSE IT BLURTS OUT UNPLEASANT TRUTHS". It differs from other commodity because it is still primarily a monetary metal and only secondarily a raw material for industry and the arts.

The French, victims of many wars against their rich country, reputedly have 5,000 tons of gold squirrelled away privately—much of it in the form of "Napoleon" gold coins.

The history of gold as a medium of exchange followed closely on the barter exchange system. In 550 B.C., Croesus, King of Lydia in Asia Minor, ordered the world's first gold coins to be struck. Gold has been universally accepted in trade for all other goods or commodities for thousands of years—long before coinage, of course.

Gold—in its monetary role—has had its most powerful effect in great empires, for example the Persian Empire under Darius, the Macedonian under Alexander, the British Empire under Queen Victoria and so on. Persia controlled most of the civilized world's gold mines in its heyday, (which Alexander took over and later they were taken by Rome). His father, Philip II, captured the gold mines of Mount Pangaion in Thrace. Britain, in the nineteenth century, similarly controlled most of the world's mine output of gold, particularly after the discovery of the great gold mines in South Africa—which is still the world's greatest single source of gold.

Britain, in 1816, the year after Waterloo, had developed the "gold standard" by fixing the trade value of an ounce of gold in terms of the pound sterling, their unit of currency. The rest of Europe joined this move in the 1870's after the Prussian war against France, while the United States and India waited until 1900 to divorce themselves from the bimetallic (silver and gold) system and fix their currencies in terms of gold. The gold standard utilized currency and gold coin interchangeably and gold moved freely to balance surpluses and deficits of international payments.

The gold discoveries in California, Australia, Canada, Alaska and South Africa in the 19th Century produced enough gold to make widespread monetary use possible.

As gold moved out of a country, the internal money supply was diminished, prices were stabilized or decreased, exports became more competitive and the deficit in the balance of payments was reduced. Thus, the economy was disciplined by gold. However, the strain on international trade posed by the World War I, 1914-18, led to the suspension of the gold standard in 1919 and signalled the end of that era.

The "gold bullion standard" existed briefly from 1925-1931 as nations restricted the international flow of gold coin, but remained willing to redeem paper notes with gold bars. Towards the end of this period many nations were moving towards the "gold exchange standard" which embodied the settlement of balance of payments deficits by the use of internationally accepted currencies. Under this system the reserve assets of the central banks of the participating countries were composed of gold bullion as well as key currencies which could be redeemed for gold. These currencies, notably dollars and sterling, steadily replaced gold as a reserve asset until in 1970, the total non-communist world's official reserves of U.S.$90 billion were almost 50 per cent "hard" paper currency.

With the price of an ounce of gold fixed in terms of the "hard" currency, (U.S. dollars), predominating the Central Banks' reserves, the possibility that trading partners might "cash in" notes for gold was always present. By 1968, this happened and free world countries, in an effort to avoid the total depletion of U.S. gold stocks by large scale international speculation, were forced to a Two-Tier Price System whereby the convertibility of the dollar into gold by speculators was halted.

Under this new system, monetary gold stocks, valued at U.S.$35.00 per ounce, remained as the standard for trade between Central Banks and were segregated from free gold stocks traded on open markets throughout the world.

The price remained frozen at U.S.$35 per ounce for 38 years through December, 1971. In 1968, the 25 per cent gold reserve requirement to be held against U.S. Federal Reserve notes in circulation was dropped by an Act of Congress. On August 18, 1971, the U.S. President suspended dollar convertibility into gold and devalued the dollar to $38 per troy ounce, (monetary price only) in December 1971.

Effective February, 1973, the value of the U.S. Dollar was again changed, this time to a fictional relationship of 35 SDR's (Special Drawing Rights), or "paper gold", to one troy ounce of gold, (or U.S.$42.2222 per troy ounce). Almost no gold changed hands between Central Banks at this price, of course. The monetary status of gold continues. From November, 1973, however, the leading central banks of the major I.M.F. countries have been able to sell gold on the free market under agreement, (in other words, the free market price has virtually become the official monetary price). Each increase in the price of gold is of course advantageous to producer countries like South Africa, the Soviet Union and CANADA, PARTICULARLY THE PROVINCE OF ONTARIO, AND TO NATIONS WITH LARGE GOLD STOCKS.

The U.S. Treasury held on to about 8,500 metric tons of gold bullion with a monetary value of over $12 billion, on the theoretical basis of $42.222 per ounce. The U.S. monetary gold stock used to be much, much larger, (21,530 tons in 1950), having been drained off in the years up to 1968 by foreign countries selling dollars to get U.S. gold. The U.S. Treasury sold off about 13,000 tons of gold in the 18 years 1950-1968, reducing their stock to only 8,500 tons.

The "new" economists have, until the recent upward zoom in the gold price, been inclined to belittle gold as a monetary standard, although the special drawing rights, SDR's, known as "paper gold", are indirectly supported by gold in a "basket" of currencies of all those countries that account for at least 1 per cent of world trade each. The U.S. dollar initially took up 33 per cent of the basket; Canadian dollar 6 per cent; D-mark 12.5 per cent; Sterling 9 per cent; etc.

In the 1970's, with growing inflation following the oil crisis, an unfavourable balance of payments, the burden of recent costly wars in Asia, and higher government debts within the U.S.A., respect abroad for the U.S. dollar as a leading reserve currency and for the "special drawing rights" greatly declined.

In the 1980's, further effective revaluations may occur. That would mean a still higher price for gold in dollar terms, almost certainly. European nations and Japan may revalue their gold stocks upwards as a way to increase their reserve assets. Revaluation of the official monetary price of gold (to say, $300 or $500 an ounce), could increase the "value" of the world's monetary reserves and STIMULATE MINING, AS IN THE 1930's.

7.22 GROWTH IN WORLD DEMAND FOR GOLD AND OUTLOOK

(The Future to the year 2000)

By the year 2000, there will be 2 billion *more* people on the earth, (mainly in Asia and Latin America, areas which historically have always had a particular yearning for gold), than in 1980. The world total will then be 6 billion in the year 2000. (Compare the world total of 2 billion in 1925.) One estimate of world population in 2030 is 10 billion—compared to 4 billion now.

By the year 2000, the world's largest cities will make a size list radically different to 1925. They are mostly in warm weather countries. Paris is further from the Equator than the others in the list. We do not know the projections of Moscow and other cities of the centrally planned countries.

31 million	Mexico City, Mexico, North America (Spanish speaking)
25.8 million	Sao Paulo, Brazil, South America, (Portuguese speaking)
24.2 million	Tokyo-Yokohama, Japan
22.8 million	New York-NE New Jersey, U.S.A., North America
22.7 million	Shanghai, China
19.9 million	Beijing (Peking), China
19.0 million	Rio de Janeiro, Brazil, South America
17.1 million	Bombay, India
16.7 million	Calcutta, India
16.6 million	Djakarta, Indonesia
14.2 million	Seoul, South Korea
13.1 million	Cairo-Giza-Imbaba, Egypt
12.3 million	Manila, Philippines
12.1 million	Buenos Aires, Argentina, South America
11.7 million	Bogota, Colombia, South America
11.3 million	Paris, France

Of the first 15 above, 5 are in Latin America. Further, 4 are Spanish speaking and 2 are Portuguese speaking. 8 are in Asia. Only 1 city is in Africa and only 1 in Europe. English is the commercial language in less than half a dozen.

Brazil, China and India will have *two* such cities *each*.

With cities of such enormous populations and with 50 per cent more people on earth than 1980, problems will develop.

WITH WORLD GOLD MINE OUTPUT LIKELY TO REMAIN QUITE LIMITED IN TOTAL—EVEN AT MUCH HIGHER GOLD PRICES THAN 1980—THE DESIRE FOR GOLD WILL REMAIN AND SO MORE AND MORE PEOPLE WILL WANT TO POSSESS SOME OF IT.

OF COURSE, THE HIGHER THE PRICE GOES, THE MORE LIKELY IT IS THAT MORE MARGINAL DEPOSITS WILL BE MINED, PARTICULARLY IN STABLE COUNTRIES LIKE CANADA

Gold could also be extracted from seawater, if the world price goes high enough.

The most likely additional forecast is that in a large and growing number of countries, private ownership of gold bullion and perhaps gold coins will be forbidden or closely controlled by governments, as in the Soviet Union, Eastern Europe etc. currently.

This would inhibit the opening up of some marginal gold mines in free countries.

In 1980, the Soviet Union had 50 million *more* people to feed than in the early 1960's. After 60 years of a centrally planned economy, it *cannot* feed all of its population now, without very large imports of grain. In the next 20 years to the year 2000, the Soviet population will presumably increase by another 50 million at least and therefore, barring some miracle in domestic grain output, even larger amounts of feed grains will have to be imported, (to be paid for with increasing exports of gold etc. to the West.) Therefore, Soviet mine output of gold will have to be increased to provide this. Basically, this is bearish for the world gold price, but where will the Soviets obtain that amount of physical gold year after year?

It is likely that China too will have to increase its grain imports to feed the growing population—to be paid for by exports to the West of gold, silver etc.

MAJOR IMPORTERS OF CEREAL GRAIN*

(million metric tons, July 1, 1980—June 30, 1981 estimated)

Soviet Union	32
Eastern Europe	12
Japan	24
North Africa/Middle East	23
China	14
Italy	7
Brazil	6
Poland	6
Egypt	6
Mexico	6
Spain	6
U.K. (see Exporters below)	6
West Germany (see Exporters below)	5

* wheat, sorghum, corn, rice, barley, millet, rye, oats and mixed

At end-1980, the world's supply of cereals was the tightest since 1974, relative to demand.

Grain imports must increase in Africa. An estimated 26 African nations had near-famine conditions in 1980. More food aid to Africa is planned.

South Africa will have to import grain in 1981, the first time in 10 years. Drought reduced the domestic crop. Imports will be around 200,000 metric tons of wheat. The current season's wheat crop will be only 1.5 million tons—down from 2 million tons in the previous year.

MAJOR EXPORTERS OF GRAIN*

(million metric tons, July 1, 1980—June 30, 1981 estimated)

U.S.A.	113
Canada	17
Australia/New Zealand	14
France	17
Argentina	14
South Africa	3
Thailand	3
West Germany (see Importers above)	2
U.K. (see Importers above)	3
Romania	2

* wheat, sorgum, corn, rice, barley, millet, rye, oats and feed grains

WORLD—LARGEST GRAIN PRODUCERS

(excluding rice and soybeans)
(millions of metric tons)

U.S.A.	252
U.S.S.R.	170
China	130
France	40
Canada	37
India	37
Australia	37
Argentina	26
West Germany	24
Brazil	25
Others	n.a.
Total	1,450

The Soviet Union is the world's leading producer of wheat, barley, rye, flax, potatoes and sugar beet.

Chapter 8

8.1 STOCKS OF GOLD

The world's above-ground stocks are very large and with the developing decline in total world mine output of gold after 1985, they are going to become increasingly important.

8.2 ABOVE-GROUND AVAILABILITY OF FINE GOLD

The amount of gold available for trade in the world is not known, because the amount of private hoarding is a mystery and the U.S.S.R., the second largest mine producer, does not release figures on either bullion stocks or mine production.

U.S. industry stocks at end-1980 were about 34 metric tons.

8.3 GOLD—VISIBLE STOCKS IN REFINED FORM

Almost all of the gold mined by man over the centuries is still visible to the human eye. Little has been lost.

Gold is so valuable that once produced it is carefully guarded and little is lost. About 80 years of mine gold production at the current rate of output is still identifiable above the ground, about half of it as bullion bars in vaults. Some 37,000 metric tons are now officially held by Western governments in official monetary stocks.

GOLD IS ACTUALLY IN VAST OVERSUPPLY IN TERMS OF COMMERCIAL DEMAND, BUT HOLDERS UNWILLING TO SELL KEEP THE PRICE UP.

Total world stocks of gold in all forms, including antiquities and hoarded coins, were estimated by the U.S. A.M.M. "Metal Statistics", to be in the area of 125,000 metric tons. Production before 1500 A.D. was only 3 tons a year—1 ton from Europe and 2 tons from Africa. Production since 1500 A.D. has reached about 80,000 metric tons. Other known refined gold metal reserves are an estimated 30,000 metric tons. Hoarded bars and coins, the arts, antiquities, ecclesiastical holdings, and gold in use around the world might amount to 60,000 metric tons, maybe much more.

E. M. Wise, in "Gold Recovery, Properties and Applications", estimated that the total world production of gold since the discovery of America has exceeded 62,000 metric tons. This seems to be a conservative number since U.S. estimates go as high as 80,000 metric tons. He estimated that of his figure of 62,000 tons, 60 per cent is still held by governments and central banks; 25 per cent by individuals or corporations and 15 per cent has been consumed or lost. This would mean that only somewhat more than 15,000 metric tons of gold is serving in useful industrial or artistic purposes.

The 85,000 tons of gold estimated to have been mined in the last 6,000 years could, if all melted down to one solid block, be contained in a cube measuring only 18 metres on each side.

Do you want to look at part of a billion dollars in gold? The U.S. Federal Reserve Bank's free "Golden Tour" is something which few tourists experience because it is one of the best-kept secrets. You have to prepare in advance for the tour by writing for tickets, which will be sent to you by return mail. Tour members are escorted by a guide to a depth of 80 feet under the Wall Street district of New York and they come within inches of $20 billion in gold—MORE THAN IS STORED IN FORT KNOX. The gold, which belongs to 75 foreign governments and international institutions, is kept in more than 120 steel compartments secured by a series of locks and auditors' seals but one compartment has been set up for display and contains more than 5,000 bars worth well over $100 million.

For tickets write: Federal Reserve Bank of New York, Public Information Department, 33 Liberty Street, New York, NY, 10045, U.S.A.

If any substantial proportion of the enormous existing above-ground gold reserves were to come onto the market, it would make nonsense of the most sophisticated and purportedly accurate estimates of gold supply and demand and the gold price would presumably fall drastically.

8.4 HOARDING

It is interesting to note that in recent history up to twice as much gold has been mined and refined in some years as has been consumed for industrial and artistic purposes. Hoarding is an important aspect of gold's monetary role. An enormous but completely unmeasured amount of gold disappears steadily into private hoards, particularly into those of the oil-rich Arab Sheikhs and the Middle East generally and into government hoards in countries outside the Group of Ten.

Hoarding of gold makes economic sense only under very insecure political conditions or under high and accelerating rates of inflation—gold earns no interest.

If world conditions stabilize and if inflation is brought under control, even in a few major industrialized countries, there would be massive dishoarding and the gold price would fall.

Incidentally, jewellery markups are so steep that it is really pointless to purchase such items as inflation hedges, but many people do this anyway, particularly in the East.

Gold has gained steadily in the last three years as an anti-inflationary investment hedge.

If another rise in interest costs develops in the U.S.A., the opportunity cost of carrying gold in store will climb considerably—possibly above the yields available elsewhere to investors.

Private buying of bullion gold by wealthy individuals in the Middle East has been going on for some time, particularly since 1974.

The U.S. Treasury estimates that 14,000 to 16,000 tons of gold, (worth about U.S.$240 Billion at early February, 1981 prices), are in private hands worldwide.

Dishoarding

It has often been the case in the market in the past that there has been from time to time a certain amount of *dishoarding* so that existing mine producer selling has been augmented. Armed conflict in the Middle East caused some distress selling of gold there in 1980. Dishoarding from the Near East and the Middle East was estimated at 150 metric tons in the first quarter of 1980. A sharp drop in industry's demand for gold also took place at that time. Dishoarding of gold in the Near East and Far East probably exceeded 100 metric tons a month during August and September, 1980, when the Iran-Iraq war broke out.

8.5 SMUGGLING: DUBAI AND GOLD

In Dubai there are no restrictions on trading in gold bars. This area has gained in importance over the years and is the centre for smuggling syndicates who transport the metal to Iran, Iraq and even India and Pakistan by boat.

The small Sheikhdom of Dubai (Dubhai, Dibay, Dubayy) of the Union of Arab Emirates, was until recently the sophisticated centre of the largest gold and silver smuggling activity in the world. Large quantities of gold were smuggled at considerable profit over 1,200 miles of sea into India by intrepid Arabs in slim dhows powered by Rolls Royce aircraft engines which often outran the cutters or hovercraft of the tiny Indian Navy. Gold smuggling is a major industry in India. Estimated gold offtake at Dubai: 1969—180 tons gold; 1970—120 tons; 1971—217 tons; 1972—145 tons gold.

If Bahrain can be described as the "Singapore" of the Persian Gulf area, then Dubai is the "Hong Kong". Dubai still earns staggering amounts of money as a gold market, partly because of the decline of its Middle East rival, Beirut, Lebanon.

Dubai's merchants now smuggle, by dhow, urgently needed supplies—at a price—into both Iraq and Iran following the outbreak of the war there in late 1980. This new trade involves millions of dollars, with payment partly in gold, probably.

It is assumed that gold going into India has remained in bullion, i.e. small ten tola bars, as a means of hiding black money or profits not filed with the government taxing authority.

8.6 MONETARY GOLD STOCKS

VALUE IN MILLIONS OF U.S. DOLLARS AT U.S.$35/oz.

	1952	1971
European Common Market	$ 3,191	$13,937
U.S.A.	22,252	10,206
Portugal	286	921
Canada	835	792
United Kingdom	1,846	777
Austria	52	729
Japan	na	679
Spain	na	498
South Africa	na	440
I.M.F.	1,692	4,732
Others (Excluding U.S.S.R., Eastern Europe and China	4,832	7,499
Total	$34,986	$41,210

The decline in the official U.S. gold holdings in twenty years, as well as those of the U.K., contrasts vividly with the rise of the official gold stocks of the European Common Market (6 nations then) and of Austria, Portugal and the I.M.F. Canada's stock experienced a slight decline.

The traditional arguments against gold as a currency reserve asset are:

1) It is bulky and very heavy.

2) It is inconvenient to transport—security problems etc.

3) The supply is largely from "unreliable" sources—South Africa and the Soviet Union.

4) It pays no interest.

5) It is entirely unproductive, except for the amount used in industry, medicine and dentistry.

However, it must be said that in the 5 years, 1976 through 1980, gold bullion kept its value better than paper currencies.

In fact, the new European Monetary System has formally restored gold as a usable asset among its member Central Banks.

U.S. economic dominance in the world is fading and since 1977 large amounts of money have moved out of paper U.S. dollars to acquire physical gold bullion.

1968 seems frozen in time, in terms of official gold stocks. Officially recorded monetary gold bullion reserves have changed very little since then and remain at just over 35,000 metric tons of gold. During the 1950's and early 1960's, gold reserves made up about 65 per cent of total foreign reserves. They fell to 32 per cent in 1971, but increased to over 60 per cent by the end of the 1970's owing to the escalation of the gold price.

In 1981, industrialized countries held about 69 per cent of their reserves in gold, but the oil exporting countries (the most important accumulators of reserves currently) only held about 21 per cent of their reserves as gold.

Gold in Central Banks

Gold is reemerging as a monetary asset. It appears that an increasing number of governments appreciate the value of physical refined bullion gold reserves. CENTRAL BANKS OF COUNTRIES ARE LOATH TO PART WITH THEM AND THOSE WITH VERY LOW GOLD STOCKS ARE INTENT ON IMPROVING THEM.

Central Banks and various government agencies were net purchasers of gold in 1980 for the first time since 1972. Total official gold holdings rose a net 118 metric tons to 35,020 tons. Opec countries were the most prominent buyers of gold for official stocks. South Africa, on the other hand withheld some newly mined gold from the market in 1980 and the Central Bank of Canada sold a little of its gold. In 1980, South Africa's official reserves of gold bullion increased by over 62.3 metric tons.

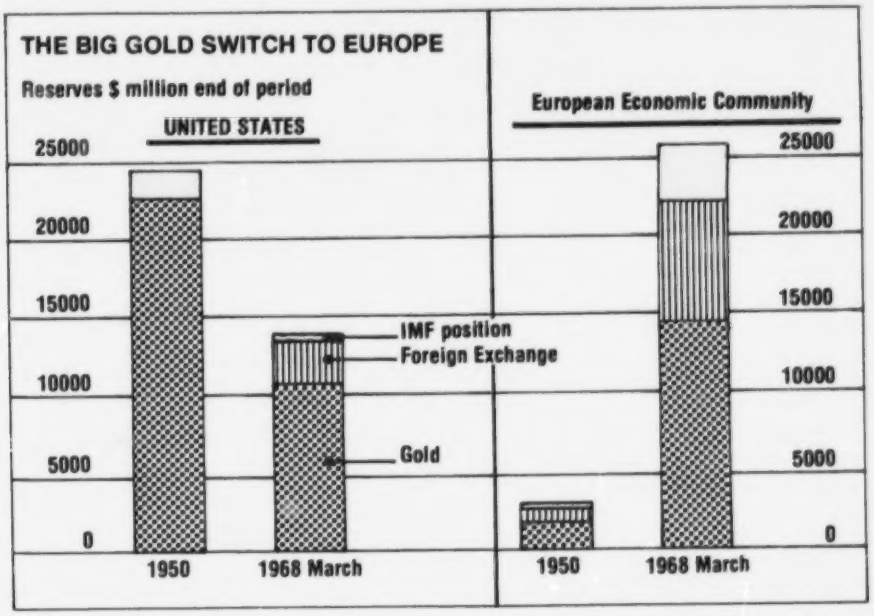
It can be said without fear of contradiction that all countries of the world would be glad to increase their gold reserves and gold cover. It can certainly be claimed that the value of gold can continue to increase as time goes on, even in real terms. INCREASES IN THE VALUE OF GOLD MUST BE VERY REASSURING TO THOSE WHO POSSESS IT AND A SOURCE OF WORRY TO THOSE WHO DO NOT.

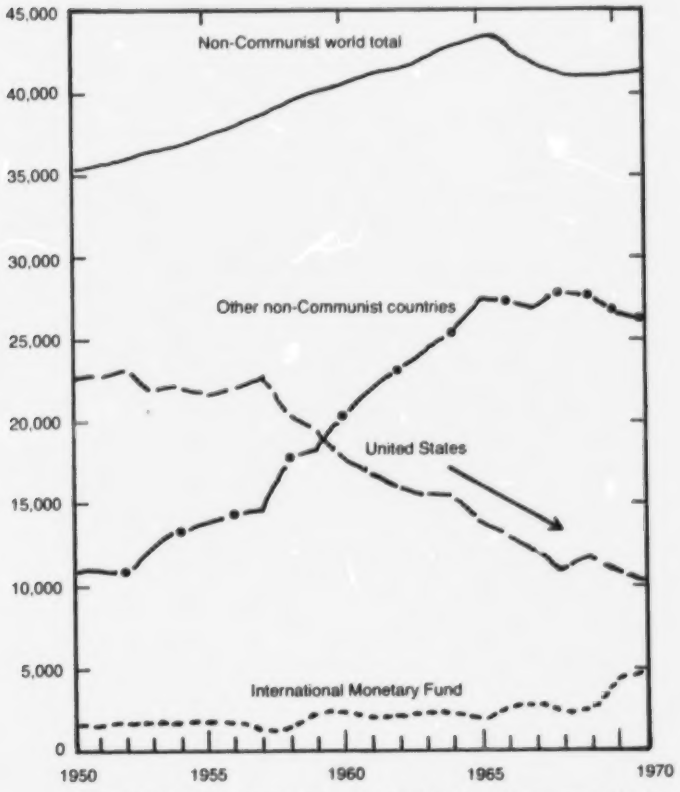
U.S. government (owned) gold stocks were down to about 8,500 metric tons of gold by mid-1974. It should be remembered however that the short-term liability indebtedness of the U.S.A. to foreigners at that time stood at over 90 billion dollars, or about seven times the official monetary value of the U.S. gold stock. (In real terms, U.S. government gold stocks are still much larger than U.S. foreign indebtedness.)

Oman has added to its gold reserves, (1979).

Gold stocks held as reserve assets by various nations are noteworthy when assessing the importance of international or domestic monetary policies which may result in the sale of reserves on the free gold market. The table which follows shows the quantities of gold held in reserve in 1952 and 1971.

Policies aimed at reducing the significance of gold in international monetary exchange could lead to participation on the free market by nations now holding large reserve assets. Even under present international arrangements, gold sales by the U.S.S.R., to earn "hard currencies" with which to purchase large quantities of agricultural and manufactured goods, may cause weakness in free gold prices.





Change in Gold reserves of free world central banks and governments leading to the freeing of the gold price in 1968.

Gold-Monetary Value, Millions of Dollars (I.M.F. valuation)

Gold has certain advantages over other monetary reserve assets:

1) it exists in finite quantity,

2) it is expensive to produce,

3) it has a non-monetary as well as a monetary use, and

4) it does not decay.

In June, 1981, at a meeting of the President's Economic Advisory Board, Art Laffer, the economist famous for "Laffer's Curve", made a pitch for monetary gold. Some disagreed but the President is reported to have said: "I think Art's got a lot of credibility there. You know, never in the history of the planet has a nation ever survived without a convertible currency".

Iran unobtrusively transferred all its gold stocks from western countries back to Tehran, the London Financial Times reported, June 18, 1980. The paper estimated Iran's stock at 14 metric tons of gold worth about $300-million.

Fort Knox Gold

The rising price of gold on world markets is making the U.S. Government's hoard of the precious metal more valuable, but that is not the way the Government looks at it.

The United States had some 8,270 metric tons of gold in its vaults at New York City, Philadelphia, San Francisco and Fort Knox. The largest stockpile is believed to be at Fort Knox, Kentucky—about 4,900 metric tons.

With international market prices of around U.S.$600 an ounce, the total U.S. gold holdings would have a theoretical value of U.S.$160 billion. But the Government values its gold at the "official" price of U.S. $42.22 an ounce. That would put the value of the Government's holdings at U.S.$11.2 billion. The official price was raised from U.S.$35 an ounce to U.S.$42.22 during the Nixon Administration, October 19, 1973.

The official price is maintained because the United States government has tried to diminish the role of gold in international transactions.

Of course, if the U.S. Government attempted to sell off a really large portion of this hoard, the international gold price would collapse and it is unlikely that the $160 billion "value" would ever be realised.

One of the most exciting discoveries of bullion gold should be mentioned here.

Forward units of the 90th Infantry Division, U.S. Army, discovered and captured the German gold bullion reserve at a so-called salt mine in Merkers, now Eastern Germany, on April 6, 1945. General M. C. Eddy, Corps Commander, inspected the vault which contained paper marks theoretically worth about one billion dollars as well as British, French and U.S. currency. The gold was behind a steel door. General George S. Patton ordered General Eddy to blow the door out.

He discovered about 4,500 gold bullion bars weighing some 35 pounds apiece. Nowadays the value would be about U.S.$1.15 billion, at a price of say U.S.$500 per ounce.

As Russian liaison officers were already arriving to take over that section of Germany, the U.S. Army quietly moved the gold out in trucks, (under their noses), to safety in what was to be the U.S. Zone, West Germany.

Germany had virtually no mine production of gold. Actually the mine at Merkers did not produce table salt but a sort of chemical that looked like asbestos, probably potash. It had 580 kilometres of tunnels, 30 to 50 feet high and about the same width.

CENTRAL BANK GOLD RESERVES

	Oct 1980 (metric tons)
Industrialised countries:	
US	8 223,1
Canada	656,0
Japan	753,6
France	2 545,8
Germany	2 960,4
Italy	2 073,7
Switzerland	2 590,3
U.K.	582,6
Other	4 121,8
Oil exporting countries	1 215,5
Non-oil exporting countries:	
South Africa	378,2
Other	72,8
Asia	607,8
Other	2 341,5
European Monetary Fund	2 663,4
I.M.F.	3 217,0
TOTAL	35 003,5

GOLD IN CENTRAL BANKS AND GOVERNMENT TREASURIES (NON-COMMUNIST COUNTRIES)

The following table, based on figures published by the I.M.F. (International Monetary Fund), shows the official gold holding of Central Banks (excluding China, U.S.S.R. and associated countries). Valued officially at U.S.$35 per fine ounce until end 1971; U.S.$38 per fine ounce in 1972. later in SDR's.

(in metric tons)	End 1979 est.	End 1976	End 1975	1974 Percent of Total	1974	1972	1970	1968	1966
International Monetary Fund	3,200	4,699	4,772	13%	4,770	4,727.7	3,856.8	2,034.2	2,357.6
Bank for International Settlements (1)	n.a.	n.a.	n.a.		200	217.7	−251.9	−311.0	−376.4
European Monetary System	2,660	n.a.	n.a.			52.9	40.4	28.0	46.6
UNITED STATES OF AMERICA	8,270	8,544	8,544	23%	8,500	8,584.6	9,838.0	9,679.4	11,760.2
United States of America "earmarked" (2)	n.a.	n.a.	n.a.	n.a.	n.a.	(12,711.9)	(11,486.5)	(11,610.9)	(11,500.1)
United Kingdom	691	652	652		n.a.	656.3	1,197.5	1,309.4	1,710.7
WEST GERMANY	2,952	3,658	3,658	10%	3,660	3,629.8	3,536.5	4,034.1	3,813.3
FRANCE	2,538	3,140	3,140	9%	3,140	3,132.1	3,138.3	3,446.3	4,653.1
ITALY	2,068	2,565	5,565	7%	2,570	2,562.9	2,566.0	2,597.1	2,146.1
Netherlands	1,363	1,689	1,689		n.a.	1,685.8	1,589.4	1,508.5	1,536.5
SWITZERLAND	2,590	2,590	2,590	7%	2,590	2,584.7	2,429.2	2,332.8	2,525.6
Belgium	1,320	1,312	1,312		n.a.	1,343.7	1,306.3	1,353.0	1,356.1
Other Europe	n.a.	n.a.	n.a.			2,609.6	2,541.2	2,880.2	2,572.3
Canada	685	673	682		682	682	702.9	768.2	930.0
Japan	673	657	657			656.3	472.8	317.2	292.4
Republic of South Africa	302	398	552	2%	680	553.6	591.0	1,104.2	566.1
Latin America	n.a.	n.a.	n.a.		n.a.	986.0	1,001.5	964.2	895.8
O.P.E.C. Countries	1,131	1,112	1,083			n.a.	n.a.	n.a.	n.a.
Middle East	n.a.	n.a.	n.a.			914.4	895.8	1,017.1	662.5
Australia	240	n.a.	n.a.			230.2	214.6	230.2	199.1
Other Asia	n.a.	559	559			625.2	659.4	702.9	594.1
Other Africa	n.a.	n.a.				388.8	367.0	354.6	136.8
	35,915	36,123	36,300	100%	36,725	36,823.5	36,692.7	36,350.6	38,378.5

U.S.S.R. bullion reserves: 2,000 metric tons (est. by U.S. Bureau of Mines); 1,600 metric tons (est. by Michael Kaser, Oxford U
U.S.S.R. bullion reserves: 3,000 metric tons (another estimate)

Footnotes to Table

1) The minus quantities denote the excess of gold deposit liabilities over gold holdings in the balance sheet of the bank. These gold deposit liabilities are shown in full as gold reserves of the countries concerned and an adjustment just therefore be made.

2) Earmarked gold is gold held by the Federal Reserve Bank for Foreign and International Accounts and is not included in the gold stocks of the U.S.A. It is shown in this tabulation by reason of its importance but is excluded from the totals at the foot of the tabulation as it is *not known* to what extent this earmarked gold is *duplicated* in the reserves shown separately by countries.

8.7 GOLD THE COMMODITY

Gold is, has been, and may well be the ultimate store of wealth. For thousands of years gold has been used for exchange and coinage and more recently as backing for currency. Pro and con arguments on gold's monetary role will continue until Domesday, the main argument in its support being that ultimately gold serves best as a measure for final settlement.

Gold is the one universally accepted currency. Gold as a commodity is extremely durable in that current production is extremely small, relative to existing stocks.

The normal commodity supply-demand relationships do not apply to refined gold, because of its unique dual function in the world, i.e. its continuing monetary status and its increasing use in industry. Although its physical and chemical properties are unique, it remains quite different from any other commodity because it is still allocated primarily as a monetary metal and has only a minor role as a raw material for industry and the arts. Without a monetary status, it would become a precious commodity subject to normal supply and demand.

The original meaning of commodity in English recorded in the 16th century had the sense or quality of the "convenience" of things in relation to the desires or needs of men. A commodity was a convenience.

But the modern sense has been extended to mean that physical item itself which is of use or advantage to mankind, i.e. any portion of the elements of wealth, useful products or leading articles of trade—virtually anything that one trades or deals in. A durable commodity's four main characteristics are that:

1) it is of an accepted standard of quality, size and weight;

2) it is limited in supply;

3) it is desired and is in demand because it possesses the power to render you a satisfaction, i.e. to satisfy human wants, whether these are logical or not;

4) it inspires confidence and trust as a measure of value in exchange and trade, particularly if it is small, portable and scarce and therefore high in value.

Certainly there has been a human passion or zest for gold since the dawn of history. Ancient Egypt was famous for gold, thousands of years before Christ.

Some things have not changed since history began—then, just as now, (where local laws permit and frequently where they do not), men will accept a weight of refined gold, whether in plain bars or stamped by a mint, in exchange for other commodities, land or food. The market value of a commodity is the value in exchange.

Another thing that is the same now as then—the bulk of the world's newly mined gold output still comes from Africa—now it is South Africa, then it was Northeast Africa, i.e. Egypt and Nubia. Nub is the ancient Egyptian word for gold.

Thirdly, mine production of gold still falls short of the universal desire for gold, just as in those far off days. The Bronze Age Greeks measured the value of weapons by using cattle as a commodity measure and the Roman word for money is derived from their word for cattle. Cattle as a commodity consume fodder, take up space, require constant attention and eventually die. (Of course, they do reproduce themselves.) A weighed lump of noble metal, particularly gold, is distinctly preferable as a commodity—since it is an imperishable and easily portable means of exchange of high value and is convenient for hoarding or long storage. Gold has earned its durable reputation over many centuries, eliminating many rivals as copper, iron and cattle.

First and foremost, gold really is money. People may quibble over definitions but it is money. It is a store of value. It is a trading medium. In addition to this, it is regarded for its beauty and for its utility.

For many decades through 1965, the U.S.A. had bi-metallic backing for the currency—large government stocks of physical gold and silver bullion and specie. Silver was then abandoned and it has since become just another commodity—officially. In the 1960's, the silver certificate dollar bills were redeemed for silver or withdrawn; the silver-bearing coins were withdrawn and melted down and the enormous stocks of government silver were largely sold to industry and dealers during the following few years.

The U.S.A. and some other countries have wanted to phase gold out of the International Monetary System and France and certain other countries have been eager to keep gold in the International Monetary System.

MORE THAN EVER BEFORE WE NOW SEE A MORE NATURAL RELATIONSHIP BETWEEN GOLD AND THE CURRENCY MARKETS. THERE HAS BEEN A GENERAL DESIRE IN THE WORLD TO MOVE INTO SOMETHING MORE TANGIBLE THAN PAPER, SO INVESTMENT DECISIONS HAVE BEEN MADE TO PURCHASE COMMODITIES IN GENERAL. IT IS NATURAL THEREFORE THAT GOLD PLAYS A WELL-PUBLICISED PART IN THIS PROCESS.

That there has been a return to gold to the detriment of paper currencies there can be no doubt. There is still no overwhelming desire to hold U.S. dollars, or for that matter sterling, judging by recent events in the world's markets and we are all therefore becoming gold-conscious.

Hedging into gold has started to come back into its own, where it is legal, as inflation has spread and accelerated throughout the world. People in higher income brackets are building inflation expectations into their personal planning, as are many corporations. The U.S. dollar has had two official "devaluations"—at end 1971 and early 1973. This has altered the price tag on the U.S. "monetary" gold stock and

those of other countries from $35 to $42.22 per troy ounce, but this is a quite unrealistic value in view of the fact that free market prices have been way above that figure since November, 1971.

Gold is such a valuable commodity that once produced it is carefully guarded and little is lost. An increasing number of governments appreciate the value of reserves of fine gold. Central banks of countries with very low gold bullion stocks are intent on improving them. IT CAN BE SAID WITHOUT FEAR OF CONTRADICTION THAT, AT THE PRESENT TIME, ALL OF THE COUNTRIES OF THE WORLD WOULD BE GLAD TO INCREASE THEIR GOLD RESERVES AND GOLD COVER.

The total "monetary" stocks of gold bullion bars presently held by the Western countries amounts to about 37,000 metric tons, including the 8,270 tons of U.S. gold. Russia probably has a gold bullion stock of between 1,600 and 2,000 metric tons. (of the 116,000 tons or so mined in human history, the balance is mostly still visible to the human eye in religious objects, art objects, museum pieces and state and personal collections.)

It can certainly be claimed that the value of gold in real, (constant), dollar terms can continue to increase as time goes on, if central banks continue to hold enormous stocks. INCREASES IN THE VALUE OF GOLD MUST BE VERY REASSURING TO THOSE WHO POSSESS IT AND A GREAT SOURCE OF WORRY TO THOSE WHO DO NOT.

Russia has tended to stockpile its gold output and release it to the west as a commodity, only in emergency situations (such as a poor grain harvest), requiring purchases from the West.

For the U.S.S.R., gold is an item of trade—a commodity. The Soviet Ministry of Foreign Trade stated in 1972 that Russia's view was that world trade could not be based just on one currency or even on several currencies, but that a more solid foundation was required and that the foundation could only be gold. Gold is the key international commodity used by Russia and China in their dealings with the West, which are largely based on barter, i.e. the exchange of commodities for commodities. Russia also releases international commodities such as palladium, platinum, oil, iron ore etc. to balance her trade.

Gold is still the payment of last resort for governments—by Russia for essential grains, by South Africa for vital imports, and by many governments yet to come.

Newly mined gold output has been falling in all the major world mine producing countries as the escalating costs of production have made many gold mines unprofitable. These are not covered, in many cases, by the limited increase in real terms in the free price of gold. Mine output of gold in the Western world passed its peak in 1970.

Mining gold has become very expensive indeed. The increased price of gold has enabled lower grade ore to be mined profitably but this means mining (bringing to surface) a much larger tonnage of rock, even though the mine makes more profit.

If, overnight, all monetary gold in Central Bank stocks become just a commodity and were freely available, all gold mines in the West could theoretically close for at least the next 40 years, with no damage to the consuming industries. It would be damaging to South Africa, of course. I would not like to speculate on what would happen to the free price in that event. (In this connection, I would like to emphasize that, at the present time, the quantities of physical gold traded on the Winnipeg, New York, Chicago, London and Zurich free bullion markets at current prices are small, compared to the total of all Central Bank stocks.)

But an overnight change from monetary to commodity gold would not happen, if ever, without extremely careful preparation. Until parity, inflation and Arab oil revenue problems are solved, nations will try to hang on to most of their gold by one means or another. Virtually no-one wants to sell gold. Even the Russians do not release it unless they feel that they have no alternative commodity to barter, in certain years.

Theoretically, sales of some monetary gold at something like free market prices by Central Banks of course mop up some of the surplus money in the Arab world and Europe. Actually, these banks are now buying gold. Being able to buy and sell gold on the free market is a very attractive way of regulating money supply for a central bank, because it does not encroach on a government's ability to borrow on the market in the same way as an open market operation with government bonds does.

There is virtually no evidence at this point in time that any really significant amount of the private (non-government) hoards of gold will be unloaded. What does seem clear is that these private hoards have gravitated to fewer and fewer hands. They are "in strong hands", as they say.

A collapse like that of the gold pool in 1968 or a "run on gold" could severely damage the U.S. and Canadian dollars. One should remember that the U.S. dollar is still by far the most important currency in the world and deserves to remain so, in the opinion of a great number of investors. The world currency and liquidity crisis is not over, but the wealth of natural resources in North America and the energy and the ingenuity of the people there will certainly contribute to the solution. Gold as a commodity is in sight, perhaps.

Gold Buying by Central Banks

The monetary role of gold is increasing rather than decreasing.

Central Banks are now conceding increasing recognition of gold as a useful asset.

Possession of gold is today the only sure base of international monetary power. Gold still remains an important reserve asset. Vast Central Bank stocks of gold bullion, repre-

senting up to 50 years of normal industrial consumption, overhang the market. See Chapter on Stocks in Central Banks. National states and/or regional economic blocs will act with self-interest in any gold transactions. Therefore, there will be no long term flooding of the market with monetary gold.

Buying and selling by the Central Banks of the major industrial powers on the free gold market is now permitted again. This could lead to greater price stability and therefore more new gold mining operations could be justified. Central Banks purchased and sold gold for their own account prior to 1961, when the old ill-fated Central Bank Gold Pool became operative.

The prospect of these relatively small market interventions could be what the gold-mining industry is after: a short-term stabilization of the free-market price without any long-term commitment to hold some particular fixed price.

Stabilization at over the U.S.$600 level or higher might help to bring in more mine financing by the larger companies.

Central Banks of the major industrial powers became buyers of gold bullion at U.S.$500 an ounce early in 1980 and at $600 in the fall. The Central Banks missed the advantages of the last gold boom since they were not permitted to deal on the open market at that time. The Central Banks of Chile, Colombia, Indonesia, Mexico, Peru, Romania and Yugoslavia increased their gold bullion holdings during 1980.

More gold than ever before is being bought by Central Banks in Europe partly as a basis of credibility for the new European Currency Unit, (ECU's). This puts gold back as a part of the international monetary reserve system. The Europeans want the ECU to be more robust than the U.S. dollar. There is, worldwide, an increasing confidence in gold as a reserve asset.

8.8 I.M.F.

Restitution of some gold bullion to member nations not indebted to the I.M.F. commenced in January, 1977. At the meeting of the 20 finance ministers of the International Monetary Fund (I.M.F.) Interim Committee held in Jamaica on January 7-8, 1976, an agreement was reached on the disposition of part of the I.M.F.'s official gold reserves. It was agreed that 777.6 tonnes of gold, one sixth of the I.M.F.'s reserves, would be auctioned over a four-year period, and the net proceeds from the sales would go into a trust fund administered by the I.M.F. for the benefit of developing countries. It was also agreed that a further 777.6 tonnes of gold would be restituted over the four-year period to member countries of the I.M.F. in proportion to their quotas in the Fund on August 31, 1975. The restituted gold would be offered at the price of 35 Special Drawing Rights (SDR) an ounce in four equal parts of 194.4 tonnes near the end of each year in which the gold is auctioned.

Gold auctioned by the I.M.F. to the end of 1977 amounted to 308.76 tonnes (9,926,800 ounces), about 40 per cent of the sales program. The auction sales prices were comparatively close to the London Gold Market quoted on the day of the auction. The successful bidders have been mainly European and North American banks and bullion dealers.

The price of gold fell sharply following the announcement on August 31, 1975 that the Interim Committee of the International Monetary Fund had agreed to abolish the official price of gold and to authorize the sale of 25 million troy ounces of I.M.F. gold at free market price levels. On the last trading day before the announcement it was U.S.$159.80 per ounce; by September 23 it was down to $127.75.

In 1979, the International Monetary Fund (I.M.F.) sold only about 170 tons of gold, compared to 227 tons in 1978.

TRUST FUND—DISTRIBUTION OF 'PROFITS' FROM GOLD SALES

(million U.S. dollars)

Member	Share of Total Profits from Gold Sales	Member	Share of Total Profits from Gold Sales
Afghanistan	5.89		
Algeria	20.65	Madagascar	4.13
Argentina	89.88	Malawi	2.37
Bahamas	3.16	Malaysia	29.56
Bahrain	1.58	Mali	3.48
Bangladesh	19.86	Malta	2.55
Barbados	2.09	Mauritania	2.09
Benin	2.09	Mauritius	3.48
Bolivia	5.89	Mexico	58.79
Botswana	0.79	Morocco	17.96
Brazil	69.88	Nepal	1.95
Burma	9.51	Nicaragua	4.27
Burundi	3.02	Niger	2.09
Cameroon	5.57	Nigeria	21.44
Central African Rep.	2.09	Oman	1.11
Chad	2.09	Pakistan	37.31
Chile	25.10	Panama	5.71
Colombia	24.92	Papua New Guinea	3.16
Congo, People's Rep. of	2.09	Paraguay	3.02
Costa Rica	5.10	Peru	19.54
Cyprus	4.13	Philippines	24.64
Dominican Rep.	6.82	Portugal	18.61
Ecuador	5.24	Qatar	3.16
Egypt	29.88	Romania	30.16
El Salvador	5.57	Rwanda	3.02
Equatorial Guinea	1.25	*Saudi Arabia*	21.30
Ethiopia	4.27	Senegal	5.38
Fiji	2.09	Sierra Leone	3.99
Gabon	2.37	Singapore	5.89
Gambia, The	1.11	Somalia	3.02
Ghana	13.83	Sri Lanka	15.55
Grenada	0.32	Sudan	11.42
Guatemala	5.71	Swaziland	1.25
Guinea	3.81	Syrian Arab Rep.	7.94
Guyana	3.16	Tanzania	6.68
Haiti	3.02	Thailand	21.30
Honduras	3.99	Togo	2.37
India	149.33	Trinidad and Tobago	10.02
Indonesia	41.30	Tunisia	7.61
Iran	30.49	Turkey	23.99
Iraq	17.31	Uganda	6.36
Ivory Coast	8.26	United Arab Emirates	2.37
Jamaica	8.40	Upper Volta	2.09
Jordan	3.67	Uruguay	10.95
Kampuchea, Democratic	3.99	Venezuela	52.47
Kenya	7.61	Viet Nam	9.84
Korea	12.71	Western Samoa	0.32
Kuwait	10.35	Yemen Arab Rep.	1.58
Lao People's Dem. Rep.	2.09	Yemen, People's Dem. Rep. of	4.59
Lebanon	1.44	Yugoslavia	32.90
Lesotho	0.79	Zaire	17.96
Liberia	4.59	Zambia	12.07
Libya	3.81	Total	1,288.70

n.b. The International Monetary Fund decided to terminate the Trust Fund, as of April 30, 1981.

TRUST FUND 'LOAN' DISBURSEMENTS

(million SDRs)

Member	First Period	Second Period	Total
Bangladesh	51.81	70.35	122.16
Benin	5.39	7.32	12.71
Bolivia	15.34	20.82	36.16
Burma	24.87	33.77	58.64
Burundi	7.88	10.69	18.57
Cameroon	14.51	19.70	34.21
Central African Rep.	5.39	7.32	12.71
Chad	5.39	—	5.39
China, People's Rep.	—	309.53	309.53
Congo, People's Rep.	5.39	7.32	12.71
Egypt	77.92	105.80	183.72
El Salvador	—	19.70	19.70
Equatorial Guinea	—	4.50	4.50
Ethiopia	11.19	15.19	26.38
Gambia, The	2.90	3.94	6.84
Ghana	—	48.96	48.96
Grenada	0.83	1.13	1.96
Guinea	9.95	13.51	23.46
Guyana	—	11.26	11.26
Haiti	7.88	10.69	18.57
Honduras	—	14.07	14.07
India	—	529.01	529.01
Ivory Coast	21.55	29.26	50.81
Kenya	19.89	27.01	46.90
Lao People's Dem. Rep.	5.39	7.32	12.71
Lesotho	2.07	2.81	4.88
Liberia	12.02	16.32	28.34
Madagascar	10.78	14.63	25.41
Malawi	6.22	8.44	14.66
Mali	9.12	12.38	21.50
Mauritania	5.39	7.32	12.71
Mauritius	9.12	—	9.12
Morocco	46.84	63.59	110.43
Nepal	5.80	7.88	13.68
Niger	5.39	7.32	12.71
Pakistan	97.40	132.25	229.65
Papua New Guinea	8.29	11.26	19.55
Philippines	64.24	87.23	151.47
Rwanda	—	10.69	10.69
Senegal	14.09	19.13	33.22
Sierra Leone	10.36	14.07	24.43
Somalia	—	10.69	10.69
Sri Lanka	40.62	55.15	95.77
Sudan	29.84	40.52	70.36
Swaziland	—	4.50	4.50
Tanzania	17.41	23.64	41.05
Thailand	55.54	75.41	130.95
Togo	6.22	8.44	14.66
Uganda	—	22.51	22.51
Upper Volta	5.39	7.32	12.71
Viet Nam	25.70	34.89	60.59
Western Samoa	0.83	1.13	1.96
Yemen, People's Dem. Rep.	12.02	16.32	28.34
Zaire	46.84	63.59	110.43
Zambia	—	42.77	42.77
Totals	841.00	2,150.37	2,991.37

8.9 U.S. TREASURY SALES OF GOLD BULLION

U.S. Treasury sales of gold in 1979 were around 373 tons, versus 126 tons in 1978.

	1978	1979e
U.S. Treasury Sales	126 tons	373 tons
I.M.F. Sales	227 tons	170 tons
	353 tons	543 tons

Chapter 9

9.1 INVESTMENT IN GOLD

SHOULD I INVEST IN GOLD

No one should invest in gold unless he/she can afford the risk.

Caution is advised. A standard 400-ounce gold bar bought in 1914 for $8,174.79 is now worth about U.S.$250,000. However, if the $8,174 had been invested at a mere 5 per cent per annum, it would have accumulated in the 66 years to about $200,000. The latter was the better investment up to mid-1979. An ounce of gold which sold for U.S.$875 in January, 1980 sold for U.S.$506.50 on January 30, 1981.

It also partly depends on the currency you start off with or *the currency in which you think*. Consider the following:

The Gold Price "rise" in dollars is different in Swiss francs, Deutschemarks and Yen.

In the eighteen months up to early July, 1978, the dollar price (U.S. funds) for gold climbed by *36.4* per cent.

However, the rise in Swiss francs in that period was *only 3.6* per cent!

This small rise in price would also be about the same in West German marks in that period.

After he retired to Switzerland, the late Charlie Chaplin is reported to have sunk all or part of his fortune from the movies into the purchase of about U.S.$15 million in gold bars years ago when gold was only $35 per Troy ounce. His widow, Oona O'Neill Chaplin, reportedly still keeps the gold in a Zurich bank vault; present day value is about U.S.$270 million, with gold at a very conservative price of U.S.$635 at end 1980.

Another very convenient way of buying gold, (in Canada for example), is to purchase a gold certificate from a bank. These can be had for as little as 10 troy ounces of gold. The gold stays in the bank and the certificate is redeemable for the amount of bullion specified. Each time the certificates are bought and sold, the bank must be paid one quarter of one per cent commission. A storage or safe keeping fee of one quarter of one per cent is also charged, or a minimum of $10 a year.

Gold gained only 5.5 per cent in value in 1980, but many investors are not disappointed. The U.S. Consumer Price Index rose 12.6 per cent in the year. By January 30, 1981, after having fallen below $500, the London closing price was down to U.S.$506.30.

Investors are made up of two types:

1) the hoarder—who buys for the long haul (motivated mainly by negative economic, political and social news), as James E. Sinclair has noted, and
2) the trader—who constantly moves in and out of the market, taking positions whatever the gold price is doing. They hop from one side of the market to another, constantly. The risks are extremely high.

With short-term money market instruments paying as much as 18 per cent on an annual basis, why do bullion coin traders continue to buy, say, one or two pieces a month? Well, about half of the 18 per cent would go for taxes.

Bullion coins—unlike gold bullion bars—do not normally have to be assayed in order to be sold.

Much of the trading in gold coins is conducted under private arrangements that produce no records for tax purposes.

If one fears the physical theft of one's bullion, special bullion accounts can now be opened instead at some large banks and brokerage houses—rather like the "pool accounts" in the precious metals business where one builds up an accumulation of a right to so many ounces of gold, which can be added to at will, and withdrawn as physical gold, at will, at any time.

If one had invested U.S.$10,000 in gold in 1976, and sold 5 years later, you could have made a "profit", of U.S.$42,204. (U.S.$10,000 invested in silver could have netted a "profit" of U.S.$29,853). Figures from Commodity Yearbook and Moody's Stock Index.

Bullion coins are the most popular form of owning gold in the U.S.A. Fewer than 2 per cent of U.S. citizens own any gold at all, but the numbers are growing. They are beginning to use gold as savings, particularly gold coins.

In Canada and the U.S.A. personal holdings of gold in bars or coins are increasing by over 20 per cent a year.

Buying Gold Metal (Bullion or Coins)

Advantages

Potentially large capital gains, collateral value for loans, worldwide marketability, broad availability of up-to-date quotations.

Disadvantages

Earns no interest, volatility of prices, speculative risks, unpredicability of demand, storage charges.

Tax Implications

Profits considered as capital gains in certain countries including Canada and 50% of them added to taxable income; U.S. tax deferral possible through annuity purchase; commissions, storage charges and interest charges deductible.

Gold Futures

Yet another variant of bullion purchases is to buy gold "futures", or commitments to buy a certain amount of gold at a given price on some specified future date. The only place in Canada where this can be done is the Winnipeg Commodity Exchange.

GOLD BULLION COINS—FUTURE ADDED VALUE AND LIQUIDITY

Name of Coin	Appreciation in Value—Rating	Liquidity —Rating
New "Maple Leaf" Canada	n.a.	n.a.
U.S. Double Eagle, $20.	1	2
Napoleon, France	2	7
1 Sovereign, U.K.	3	5
100 Kroner, Austria	4	2
50 Peso, Mexico	5	3
20 Peso, Mexico	6	4
1 Krugerrand, South Africa	7	1

n.b. Rating 1 = best
Rating 7 = worst

Appreciation rating in terms of possible future added value due to coin form over and above gold content.

Liquidity rating in terms of readiness of buyers on resale.

Source: Paul Sarnoff, Trading in Gold, 1980.

SMALL BARS OF GOLD

Weight and Size

1000 Gram	(= 32.151 Troy Ounces)	117.0 × 52.0 × 9.0 mm
500 Gram	(= 16.075 Troy Ounces)	86.0 × 38.0 × 8.5 mm
250 Gram	(= 8.038 Troy Ounces)	58.0 × 30.0 × 8.0 mm
100 Gram	(= 3.215 Troy Ounces)	45.0 × 25.0 × 5.0 mm
50 Gram	(= 1.608 Troy Ounces)	34.0 × 19.0 × 4.0 mm
10 Ounce	(= 311.035 Gram)	58.0 × 32.0 × 9.0 mm
10 Tolas	(= 116.638 Gram)	45.0 × 27.0 × 6.0 mm
100 Gram (thin)	(= 3.215 Ounces)	47.5 × 27.5 × 4.3 mm
50 Gram (thin)	(= 1.608 Ounces)	44.2 × 25.7 × 2.5 mm
20 Gram	(= 0.643 Ounces)	31.3 × 18.3 × 2.0 mm
10 Gram	(= 0.322 Ounces)	25.5 × 15.5 × 1.5 mm
5 Gram	(= 0.161 Ounces)	23.0 × 14.0 × 1.0 mm
1 Ounce	(= 31.1035 Gram)	41.0 × 24.0 × 1.9 mm
½ Ounce	(= 15.5518 Gram)	28.5 × 16.9 × 1.9 mm

Gold bars frequently require costly assaying before they can be sold, but with coins, no assay is needed on sale and there is a ready market.

9.2 SALES TAX ON BULLION

Potential bullion buyers, whether coin or bar, should look at sales tax legislation.

For example, in Canada, there would probably be no provincial sales tax in Quebec, but in Ontario, investors would be required to pay the provincial sales tax of seven per cent on bullion coins such as the Krugerrands. On a one-half ounce coin (at say C$700 per ounce), the Ontario sales tax would be about $25.00. Buying a bullion gold coin in Montreal etc. would presumably be cheaper than buying it in Toronto.

9.2.1 COINS OF GOLD. See Chapter 7.3.

Chapter 10

10.1 REFINING OF GOLD

Cyanide Process

Most of the gold recovered from the world's mines is obtained by treating gold-bearing quartz by the cyanide process.

The gold is dissolved out of the quartz solution, which is then run into long boxes filled with zinc shavings and the gold is precipitated as a black slime. This is melted with an oxidising agent which removes the zinc and leaves gold.

Amalgamation with mercury is an ancient method.

Refining Addition to Gold

Ruthenium, one of the platinum group metals, is used as a grain refining addition to gold.

Gold Recovery—Burning the Floors

Gold refineries find it pays to shut down once a year to burn the wooden floors and to clean their stacks and rooftops to extract from the ash and congealed soot and grime tiny particles of gold that have escaped from the furnaces. One London merchant bank used to take up the wooden floor of its vault and burn it, to melt out countless specks of gold that had rubbed off the soft bullion bars over a generation.

The Rand Refinery in Germiston, South Africa, is the world's largest gold-processing plant. Not a speck of the precious metal is wasted. The machines and furnaces are brushed every few minutes and the floor constantly swept. With the price of gold so high, even a few grains caught in a crack mean money lost.

Security is low-key but it is complete. Metal detectors, one-way windows and hidden cameras make sure of that.

MELTERS AND ASSAYERS APPROVED FOR LONDON GOOD DELIVERY (GOLD)

AUSTRALIA

Australian Mints
Matthey Garrett Pty. Limited, Sydney
Garrett, Davidson, & Matthey Pty. Limited, Sydney
Engelhard Industries Pty. Ltd., Thomastown, Victoria

BELGIUM

Societe Generale Metallurgigue de Hoboken
Johnson, Matthey & Pauwels, S.A.

CANADA

Royal Canadian Mint, Ottawa, Ontario
Engelhard Industries of Canada Ltd., Aurora, Ontario
Johnson Matthey Limited, Toronto, Ontario
Canadian Copper Refiners Ltd., Montreal
Canadian Copper Refiners Ltd. was merged into Noranda Mines Ltd. December 31, 1978. Refined metal production in 1978 was around 14 metric tons of gold.

CHINA, PEOPLE'S REPUBLIC OF

Refinery of China, Peking

FRANCE

Melters and Assayers

Jean Boudet
Les Fils de Paul Dubois, or Robert Dubois
Caplain-Saint-André
Compagnie des Métaux Precieux
Comptoir Lyon-Alemand et Marret, Bonnin, Lebel et Guieu reunis
Comptoir Lyon-Alemand, Louyot & Cie.
Les Anciens Etablissements Leon Martin

Melters

Comptoir Lyon-Alemand
Marret, Bonnin, Lebel et Guieu
French Mint (Monnaie de Paris)

GERMANY

W. C. Heraeus G.m.b.H., Hanau
Deutsche Gold und Silber-Scheideanstalt, Vormals Roessler, (DEGUSSA)
Norddeutsche Affinerie (N.A.)

GREAT BRITAIN

Melters and Assayers

Bank of England
Royal Mint, London
N. M. Rothschild & Sons
Johnson, Matthey & Co., Limited
Johnson Matthey Chemicals Limited
Johnson & Sons' Smelting Works Limited
H. L. Raphael's Refinery
Sheffield Smelting Co., Ltd. (Engelhard Group)

Assayers

F. Claudet Ltd.
Daniel C. Griffith & Co., Ltd.
Johnson & Sons, Assayers, Ltd.

ITALY

Metalli Preziosi S.p.A., Milan

NETHERLANDS

Dutch Mint (Rijks Munt)
Schone's Essaieer-Inrichting en Handel in Edele Metaalen N.V.
H. Drijfhout & Zoon's Edelmetaalbedrijven N.V.

SOUTH AFRICA, REPUBLIC OF

Rand Refinery Limited
South African Mint

SWEDEN

Swedish Mint (Kongl Myntet)

SWITZERLAND

Melters and Assayers

Société de Banque Suisse, de Locle
Métaux Précieux S.A., Neuchatel
Usine Genevoise de Degrossissage d'Or, Geneva
Argor S.A.

Melters

Swiss Federal Mint, Berne (Monnaie Federale Suisse)

Assayer

Bureau Central Suisse, Bern (Controle Metaux Precieux)

U.S.A.

United States Assay Offices and Mints
United States Metals Refining Company, Carteret, New Jersey
American Smelting & Refining Company, Perth Amboy, New Jersey

U.S.S.R.

State Refinery, Moscow
All Union Gold Factory

OFFICIAL LIST OF NEW YORK COMEX APPROVED BRANDS OF GOLD BARS AND MARKINGS

Producer	Refined at	Brand marks
All Union Gold Factory	(Soviet Union)	CCCP (with hammer and sickle)
Argor, S.A.	Chiasso, Switzerland	ARGOR SA CHIASSO (with SAA)
ASARCO Incorporated	Amarillo, Texas	ASARCO GOLD—AMARILLO TEXAS
	Perth Amboy, NJ	ASARCO-PERTH AMBOY
Canadian Copper Refiners Ltd.	Montreal East, Quebec, *Canada*	CANADIAN COPPER REFINERS LTD.
Compagnie des Métaux Précieux	Paris, France	COMPAGNIE DES METAUX PRECIEUX—PARIS
(Bars produced for Société de Banque Suisse will also contain assayer's stamp 'SBS')		
Comptoir Lyon—Alemand Louyot	Noisy Le Sec, France	COMPTOIR-LYON—ALEMAND, LOUYOT—PARIS
Deutsche Gold und Silber Scheideanstalt, (Degussa), Vormals Roessler	Frankfurt, West Germany	DEGUSSA
H. Drijfhout & Zoon's Edelmet-aalbedrijven N.V.	Amsterdam-Centre, Netherlands	
Engelhard Industries Ltd.	Cinderford, Gloucestershire, UK	ENGELHARD LONDON (with large letter 'E')
Engelhard Industries Pty Ltd.	Thomastown, Victoria, Australia	ENGELHARD INDUSTRIES PTY. LTD. AUSTRALIA (also 'ASSAY OFFICE' with large letter 'E' within octagon)
Engelhard Industries of Canada Ltd.	Aurora, *Ontario* Canada (formerly produced at Toronto, *Ontario*.)	ENGELHARD (with circle connected to half-moon)
Engelhard Mining & Chemical Corp.	Newark, NJ Newark, NJ	ENGELHARD (with large letter 'E') BAKER
Handy & Harman	Attleboro, Mass.	HH HANDY & HARMAN
W. C. Heraeus GmbH	Hanau am Main, West Germany	
Homestake Mining Company	Lead, South Dakota	HMC HOMESTAKE MINING COMPANY (within circle)
Johnson Matthey Limited, (formerly	Brampton, *Ontario* Canada	JM CANADA (with crossed hammers)
Johnson Matthey & Mallory Ltd.)	Brampton, *Ontario* Canada	JOHNSON MATTHEY & MALLORY—CANADA (no longer produced)
Johnson Matthey Chemicals Ltd.	Royston, Hertfordshire, UK	JOHNSON MATTHEY LONDON

Johnson Matthey & Pauwels SA.	Brussels, Belgium	JOHNSON MATTHEY AND PAUWELS
Johnson Matthey Inc. (formerly Matthey Bishop)	Winslow, NJ	MATTHEY BISHOP U.S.A.
(Also distributes Johnson Matthey London brand in US)		
Matthey Garrett Pty Ltd.	Kogarah, New South Wales, Australia	MATTHEY GARRETT PTY—SYDNEY
Metaux Précieux S.A.	Neuchâtel, Switzerland	METAUX PRECIEUX SA (with refiner's assay stamp 'MP')
(Bars produced for Société de Banque Suisse will contain assayer's stamp 'SBS')		
Metalli Preziosi S.p.A.	Paderno Dugnano (Milan), Italy	METALLI PREZIOSI SpA (with MP inside a diamond)
NV Metallurgie Hoboken-Overpelt S.A.	Hoboken, Antwerp, Belgium	METALLURGIE HOBOKEN OVERPELT
	Hoboken, Antwerp, Belgium	SOCIETE GENERALE METALLURGIQUE DE HOBOKEN (no longer produced)
	Hoboken, Antwerp	METALLURGIE HOBOKEN (no longer produced)
Norddeutsche Affinerie	Hamburg, West Germany	NORDDEUTSCHE AFFINERIE HAMBURG
The Perth Mint	Perth, Western Australia	THE PERTH MINT AUSTRALIA (with swan motif mint mark within circle)
Rand Refinery Ltd.	Germiston, Transvaal	THE RAND REFINERY LTD (circled around a picture of a springbok)
Royal Canadian Mint	Ottawa, *Ontario*	ROYAL CANADIAN MINT (encircling a crown)
Schone Edelmetaal BV		
Sheffield Smelting Co. Ltd. (Engelhard) Refiners and Fabricators of precious metals	Sheffield, UK	THE SHEFFIELD SMELTING CO. LTD.—LONDON & SHEFFIELD
State Refinery	Moscow, Soviet Union	CCCP (with hammer and sickle)
United States Assay Office	New York City, NY San Francisco, Cal. (no longer producing)	Seal of United States within circle with year and location of production
United States Metals Refining Co.	Carteret, NJ	DRW
United States Mint	Philadelphia, Pa. Denver, Colorado	Seal of United States within circle with year and location of production (no longer produced)
Valcambi S.A.	Balerna, Switzerland	VALCAMBI (with refiner's assay stamp 'CHI')
	Balerna, Switzerland	CREDIT SUISSE (with refiner's assay stamp 'CHI')

10.2 MAJOR PRIMARY GOLD REFINERIES

The world's major primary gold refineries in the principal gold mining countries include:

CANADA	Inco, Copper Cliff, Ontario Royal Canadian Mint, Ottawa, Ontario Johnson Matthey Ltd., Brampton, Ontario Canadian Copper Refineries, Montreal, Quebec Imperial Smelting and Refinery Co., Markham, Ontario
SOUTH AFRICA	Rand Refinery—the world's largest
U.S.S.R.	a) All-Union Gold Factory, and b) State Refinery, Moscow

GOLD REFINERIES IN ONTARIO

1) Royal Canadian Mint—Ottawa, Ontario

Feed: rough gold bullion from mines and smelters, jewellery scrap and placer deposits to 24 oil-fired furnaces and 48 electrolytic refining cells; capacity, 7 million fine ounces of gold per annum by chlorination and electrolytic process; extraction of fine silver.

2) Johnson Matthey Ltd—Brampton, Ontario

Treats rough gold bullion from mines and smelters, jewellery, electroelectronic scrap and placer mine deposits to induction furnaces and electrolytic refining cells. Fine gold produced by chlorination process; gold delivery bars, investment bars, gold based chemicals and plating solutions are produced.

3) Inco

Refines over a ton of gold a year at the Copper Cliff refinery near its Sudbury mines in Ontario.

4) Engelhard, Aurora, Ontario

Licensing of Gold and other Precious Metal Refineries

Facilities in Ontario for refining precious metals must be licensed under the provisions of The Mining Act. This is aimed at "highgraders" and their accomplices who steal naturally-occurring gold metal or high grade ore from a mine and have it reduced to crude gold bullion at a refining facility. Without a licence the refining is illegal. These licences are reviewed annually by the Mineral Resources Branch of the Ministry of Natural Resources, which administers that section of the Act.

Appendix I

SOVIET GOLD

ORE RESERVES OF GOLD—U.S.S.R.—UNMINED

Russia's geological resources, comprising perhaps 130,000 metric tons of gold still in the ground may fall short of those of South Africa by three or four times.

Gold ore reserves in the U.S.S.R. have increased dramatically since 1972 largely because of the higher gold prices. Together with higher base metal, oil and gas revenues, total Soviet purchasing power in the West has greatly increased, but this is offset to some extent by the greatly increased costs of equipment imported from the West into the U.S.S.R. Oil and gas revenues from abroad are expected to decline sharply and then disappear during the 1980's.

Soviet gold in ore reserves was estimated in 1980 as 6,250 metric tons approximately, whereas unmined gold reserves in South Africa may be 33,000 to 50,000 metric tons, (say 1 to 1.5 billion ounces).

As the gold price goes even higher, the volume of unmined gold reserves automatically increases. When it falls, gold reserves decrease.

Soviet Gold Mines

Most of the modern U.S.S.R. production is from placer or river-bed deposits in the Soviet Far East. The Soviet Far East is not regarded as Siberia proper.

Nearly all of Siberia and the Soviet Far East make up a terrible area in which to live. The very long sub-Arctic winter starts in September. However, 70 to 80 per cent of the country's natural resources, including mineral resources, are found there. The absolute necessity of developing them somehow is accepted. However, it is becoming more and more expensive to ship equipment to and extract and transport raw materials from remoter areas. Russia's great distances are working against her.

Placer gold mines need water. In the harsh Soviet Far East THEY CAN BE WORKED ONLY DURING THE 140 DAY-SUMMER SEASON.

The biggest gold discovery before the Revolution was on a tributary of the great Lena river, the Bodaibo, in 1863. By 1917, 39 companies, Russian and foreign, were working in the Lena basin. One was Lena Goldfields, a British company which returned in Lenin's day as a gold mining concessionaire.

"Sent to the salt mines in Siberia" is a phrase Westerners grow up with. This is a statement that would draw a blank with those Soviet citizens old enough to remember Tsarist days. Prisoners in Siberia never mined a grain of salt. It was the gold placer mines that many were sent to, dredging and sifting the river bank gravels in the open, cold and exposed, (not down in warm underground mines), working under especially brutal conditions and this continued into the Soviet period. One wonders whether there is any mistaken transfer of the Russian word for gold, "zoloto", across to salt. Sol' is the Russian word for salt. It could be a grim sort of pun.

"The miners have to work wading knee-deep in ice-cold water and after the long day's work they spend the night in overcrowded barracks, begrimed with dirt and teeming with vermin. Disease, especially scurvy and diarrhea, is rife and the mortality enormous".—J. Stadling, "Through Siberia," 1901. They worked through the "summer" without wages and were then turned loose with a single payment which soon vanished in the saloons and brothels of Vitim or Olekminsk.

In the Lena gold camp, at a concession held by a British company, early in 1912 the workers went on strike, since no-one had heeded their timid demand for improved living quarters in that bitter climate and for an improved quality of food. The army opened fire, as usual, on a gathering of about five thousand striking miners, killing around two hundred and wounding about the same number. What was unforeseen was that this massacre received great publicity and was in fact only the first of a new wave of strikes throughout Russia just before the carnage of World War I, providing a new generation of revolutionaries with fresh, golden opportunities, leading to well-known results.

Bodaibo (Bodaybo) is NE of Lake Baikal. The new BAM (Baikal-Amur) railway will run 2,000 miles from a point East of Krasnoyarsk to Komsolmol'sk na Amure, connecting to the Trans-Siberian track to the Pacific coast. Lake Baikal is the deepest freshwater lake in the world, 1,500 metres at its maximum depth, and in proportion to its surface area, has the largest volume of water, about 23,000 cu. km. or approximately the total volume of the Baltic and the Kattegat whose surface area is 12 times that of Baikal. Conditions are so gruelling in constructing the line that some know it as the death line.

Some gold fields in the Soviet Far East may be opened up when the new BAM railway starts working in 1985, providing access to vast new territories for mining operations. Russian geologists claim that eastern Siberia has half of the world's entire coal reserves.

The new railway may in effect directly contribute to *doubling* the Soviet ore reserves of gold.

Gold ore grades have fallen at both the Kolyma and Chukotak mining regions. A third more ore has to be taken out to recover the same amount of gold as in 1976.

Much of the new gold is found by independent prospectors in "Artels"—almost like free enterprise units, small private gold exploration groups who can still strike it rich. Their pay depends on how much gold they find, with no upper limit. The minimum appears to be about 10,000 roubles a

year—perhaps equivalent to U.S.$15,000—exclusive of fringe benefits.

The Aldan Plateau gold deposits in southern Yakutia were discovered in the early 1920's. A sect well known in Canada, the Dukhobhors, were exiled to the valley of the Aldan river by the Tsar.

The major deposit on the Upper Kolyma river started production at the end of 1933. The Indigirka and Kolyma rivers both empty into the Arctic Ocean. For about 25 years, they were worked by political prisoners and ordinary convicts under harsh, primitive conditions—until the death of Stalin. One camp still reported is a strict regime operation for work in the gold mines at Korkino, Chelyabinsk region.

Near the source of the Indigirka, an icefield exists from which over 2,000 glaciers descend, covering between them an area of 90 square miles.

In the Upper Kolyma and Indigirka River valley gold mines, forced labour was used in the 1930's and 1940's.

In the 1940's, a unit of the NKVD, later MGB and then KGB, called Dalstroy, in the Magadan zone of the Soviet Far East, ran prison camps in the Kolyma gold mining region under the command of NKVD General I. F. Nikishov. The annual mortality rate in the open river bed placer mines was 30 per cent and in the 1937-41 period, about a million Dalstroy prisoners perished, according to Robert Conquest. Dalstroy is 220 miles ESE of Ust Nera, Yakutia. Dal'stroy is short for Glavnoye Upravleniye Stroitel'stva Dal'nego Severa (Main Administration for Construction in the Far North). From end-1931, Dal'stroy had absolute control over about 2.8 million square km in the Soviet Far Northeast until 1957, when Severovostokzoloto was created. Severovostokzoloto means North Eastern Gold and now covers only the Magadan Oblast area.

Main Gold Mining Associations in the Soviet Far East and Siberia (last estimates of gold output)

About 90 metric tons from "Severovostok-zoloto" (Far Northeast)

Believed to be 7 combines, 50 enterprises, 500 washing plants, 30 placers, 3 mines.

This area is the main source of Soviet gold currently. Chukchi National Okrug in the Far Northeast near the port of Pevek on Chaun Bay is the largest producer. The first gold mining town, Bilibino, was founded in 1960, population 12,000, 1967.

Bilibino lies East of the gold mines and SW of Chaun Bay, which is east of the mouth of the Aldan river.

A small nuclear power station (0.048 million kw) supplying the tin and gold mining nearby had been built at Bilibino by the early 1970's.

New gold mining areas: East northeast of Bilibino, near Cape Schmidt on the Arctic Ocean. A small underground mine is under development near Bilibino.

i) near the town of Leningradskiy, which is near the Arctic coast, west of Cape Schmidt.

ii) near the town of Polyarnyy, east of Leningradskiy. (Polyarnyy is ONLY 370 MILES WEST OF POINT HOPE, ALASKA, U.S.A.) One might mention here that Leningrad is much closer to New York than to the Soviet Far East port of Vladivostok.

Magadan, (population 105,000, 1974), was founded in the 1930's as the base for the exploitation of the Kolyma gold fields. Its tree-lined streets are covered with snow for most of the year.

The Magadan province has

35 placer mines
23 dredges
500 plus sand washing rigs
1,500 bulldozers.

A 1969 survey showed that one quarter of the population of the Magadan district arrived in, or left, it in the course of two years.

Gold production in Magadan has been hampered by administrative inefficiency and labour indiscipline for some years. The gold content of its deposits has been falling and it appears to have been overtaken by Uzbekistan in gold output.

The Kapitalnaya gold-silver lode mine of the Karamken Combine near Magadan began to ship ore in 1977. Separate recovery of the silver was the first in the Soviet Far East.

67 metric tons from Yakut-zoloto

4 combines, 40 enterprises, 175 washing plants, 20 placers, 6 mines. New (imported) mining equipment reported.

Yakutia is the coldest land in the Northern hemisphere. Mining conditions are extremely harsh. Aldan is a major gold source. At the Ust-Nera gold operation in the Indigirka River valley, temperatures reached 94.8 degrees below zero Fahrenheit in 1959. The low for the 1977/78 winter was only 70.16 below zero Fahrenheit. Seven dredgers there feed a concentrating plant at Sarylakh, near the Arctic Circle.

The Arctic Circle, (Polar Circle), 66 degrees, thirty minutes north, is the line of latitude above which the sun does not rise during the winter solstice and does not set during the summer solstice.

(Sources of gold at Bilibino, Leningradskiy, Polyarnyy, Yakutia, Noril'sk and Nikel-Pechenga are all north of the Arctic Circle.)

A 650 mile gravel road connects Ust-Nera to the Pacific coast town of Magadan, the port of entry for all vehicles, equipment and supplies for the Kolyma Upland gold fields.

12 metric tons from Amur-zoloto, Upper Amur River.

17 placers, 2 mines, 6 operations, 40 washing plants.

8 metric tons from Primor-zoloto, Pacific Maritime Region.

100 placers, 1 mine, 6 operations 40 dredges.

Primorzoloto means Maritime Gold, i.e. the land area bordering the Soviet Pacific coast from SE of Magadan to

Vladivostok, Kamchatka peninsula and Sakhalin island, as well as the underwater deposits in the Sea of Okhotsk.

18 metric tons from Len-zoloto, Lena River.

3 mines, 3 complexes, 50 dredges or washing plants.

The Lenzoloto trust was the leading gold dredging enterprise.

32 metric tons from Zabaikal-zoloto, East of the Lake Baikal

11 mines, 10 placers, 3 complexes, 50 dredges.

24 metric tons from Zapsib-zoloto, Western Siberia, Khakassia

10 placers, 16 mines.

8 metric tons from Yenisei-zoloto.

The development of Krasnoyarsk on the Yenisei river, where the world's largest platinum group metals refinery is located, is due to the gold mines nearby and the Trans-Siberian railway. There are gold mines to the southeast in the Altai-Sayan mountains.

Some gold is obtained from the very large Noril'sk nickel mines in the North.

Even if the nickel-copper-cobalt mines at Talnakh etc. are producing much higher grades of gold and P.G.M.'s, it is strong odds that the ores will continue to contain palladium, not gold, as the dominant precious metal, i.e. over 70 per cent. Since the world's mines and secondary refineries are already producing far more palladium than the world can possibly consume—with a relatively low price—the extra palladium production will have to be stockpiled and therefore will be of no financial benefit to the U.S.S.R., unless they flood the market with palladium at a much lower price, or dispose of large quantities of palladium as part of complicated barter deals. The major precious metals refinery in the U.S.S.R. serving the Noril'sk mines is located 900 miles due South of Noril'sk, Krasnoyarsk.

Gold Production (annual) (metric tons estimated)	Mining Area
	Soviet Central Asia
	(conquered by Russia just over a century ago)
	The area was ruled for centuries by the Mongol Golden Horde—that word 'gold' again.
	The largely Muslim population of Soviet Central Asia, (which has a tolerable climate), appears to have grown by about 30 per cent in the nine years since 1970. The present population is estimated as about 40 to 50 million people in a total Soviet population of 262 million, or 275.5 million by 1976, according to other estimates.
	The Uzbeks are the most numerous of the Turkic peoples of the U.S.S.R.
	It is also estimated that the Soviet Central Asian population will double by the end of the century. There is more private housing, (about one third), for one thing, compared to the rest of the Soviet Union.
	By contrast, the Western Soviet Union's Slavic population has grown slowly—by only 6 per cent in that nine years.
	Birth rate decline has been most marked among the Slav populations of the Russian Soviet Federated Socialist Republic of the U.S.S.R.
	Apart from the Muslim faith, the Uzbek, Kazakh, Kirghiz, Karakalpaks, Uygur and Turkmen peoples have another strong mutual bond—they are of Turkic origin, sharing the same traditions and speaking the different dialects of the Turkish language group.
	(Central Asia is the Soviet Union's major source of uranium.)
	Uzbek S.S.R.
	(a sunny climate with short winters)
	—The Uzbeks are the third largest ethnic group in the Soviet Union. Uzbekistan S.S.R.: 12 million people.
24 tons (1974)	Uzbek-zoloto Association, Uzbekistan
	7 ore mines, 4 complexes
	The two largest gold producing mines in the Soviet Union are in Uzbekistan: Muruntau and Kal'makyr. The latter is a large base metal mine producing gold as a byproduct.
	CENTRAL UZBEKISTAN IS ALLEGED BY SOME TO BE THE MOST PRODUCTIVE REGION FOR GOLD IN THE U.S.S.R. Perhaps this means non-placer gold.
	—Muruntau-zoloto (''enormous quantities'')
	—Zarafshan-zoloto
	—Kochbulak
	—Angren-zoloto

—Chadak-zoloto
—Arnasay
—Sanarchuk

Several gold lode deposits have been developed in the Kurama mountains and across the Fergana valley on the slopes of the southern mountains about 100 kilometres northwest of the chemical city of Navoi, which is connected by rail to a huge open pit and underground gold lode operation. The Fergana basin is enclosed by mountains. Navoi, near Bukhara, was founded in 1958; population 17,000, 1966. The Navoi Mining Combine is a significant uranium producer.

An enormous low grade deposit of gold was discovered in Uzbekistan in 1958 at *Muruntau* (''tau'' means mountain or range in Russian) in the desert of Kyzul-Kum which means ''red sand'' in Turkic, Persian and Russian. Mining of the rich gold-bearing rock commenced in 1967 at this shallow open pit and developing underground operation.

The first gold was poured there in July, 1969. Resin-in-pulp ion exchange metallurgy is employed.

It is claimed to be *THE WORLD'S LARGEST GOLD MINE* when in full production—certainly the largest gold operation in the Soviet Union—estimated to be able to produce 80 metric tons a year eventually. Reportedly, it may be able to maintain that output into the 1990's. (Vaal Reefs, the Western World's largest single producer of gold, produces about 65 to 70 metric tons a year.)

It is also said to be one of the LOWEST COST gold operations in the country.

The deposit lies in the centre of a desert area at the foot of the mountain of the same name. It is overlain by only a few metres of sand and mostly occurs in a free form of varying purity.

Stage 1 was ready by 1971. Both open pit and underground methods are in operation. Construction of large new excavators is underway: a large drag-line excavator, capacity 20 million cubic metres a year; a bucket excavator, 15 million cubic metres a year capacity.

—the open pit was 100 metres deep in 1979

—1979 output: 15 metric tons of gold

—overburden/ore ratio 35:1

—development of the new underground mine continues.

Water for the *Muruntau* mine is brought across the desert 200 kilometers by a 48 inch aqueduct from the Amu Darya river, (the river Oxus of history).

Most of the region's rivers flow towards the Aral Sea, but only the Amu Darya and the Syr Darya, (known in the West as the Jaxartes), actually reach it across the desert.

Zarafshan or Zeravshan is the new city built for the mine workers and takes its name from the river of the same name to serve the gold mine complex. In the Uzbek language, Zeravshan means ''bestower of gold''. Originating in the Zeravshan mountain range, the Zeravshan river (ancient Polytimetus) flows through a fertile valley to the city of Samarkand, (population 300,000) and empties into the desert, falling short of the Amu-Darya river.

The ancient name of the oasis of Samarkand in the valley of the Zeravshan river was Maracanda. The 17th Century mosque there is named Tilly-Kari, which means ''decorated with gold''.

About 5 kilos of gold, (over 160 troy ounces), were used to restore the exterior of the famous Gur-i-Amir mausoleum of the conqueror Tamerlane. Born 40 miles away, he made Samarkand in 1369 the capital of his empire which stretched from China into Europe.

Near Samarkand is the town of Superfosfatnyy, (Superphospate). The largest phosphorite (fertilizer) deposit in the U.S.S.R. is situated in the Karatau range.

In Bukhara (Bokhara), 112,000, under a trading dome over a busy street crossing called Toki-Zargaron, goldsmiths have worked and traded from the 16th Century.

A 125 mile long canal, completed in 1966, running from the Amy-Darya river across the desert reaches the city of Bukhara using electric pumps. One of the world's largest natural gas fields was discovered not far from Bukhara in the 1950's.

South of Bukhara, and SE of Chardzhou (Chardshoy) there are silver mines to the north of the Kara Kum Canal, on the left bank of the Amu Darya river in Soviet territory.

Just across the border, (which is the Amu-Darya river at that point), in Afghanistan—an area once known as Bactria—a Soviet-Afghan archaeological team uncovered in 1978 an ancient temple and a startling treasure trove of gold objects, dating from the period 100 B.C. to 100 A.D., at Tillya Tepe (''Golden Mound''), three miles north of the town of Shibarghan. Tepe is Turkic for hill or peak.

20,000 gold objects were found, with a purity of about 700 fine or about 17 karats. They include gold and turquoise bracelets, necklaces, pendants, gold and silver discs, daggers, and a gold bowl.

Bactria (Bakhtrish) lay astride the ancient silk and spice routes to the Middle East and Europe. The Greek, Alexander the Great, conquered it in 331 B.C. Bactra town was also called Balkh or Zariaspa. Bactria (also called Bactriana, Persian Bakhtrish, Chinese Ta-hsia).

The Shibarghan treasure is uniquely Bactrian, not imported.

Since borders were different in those days, the gold probably came from a little further north in what is now the Soviet Uzbekistan S.S.R.

Gold Production (annual) metric tons	Mining Area Soviet Central Asia

Kirghiz S.S.R.

0.5 ton — Kirghizia — 2 ore mines

—Chatkal ore mine
—Sultansary ore mine (sary is persian for town)

Tadzhik (Tajik) S.S.R.

3 tons — Tadzhik-zoloto Enterprise, Tadzhikistan — 1 placer, 2 ore mines

—Yakusu Tabasmara and Iskander Kul. Iskander is the Turkic pronunciation of Alexander, the Greek, Conqueror of the area.

Kazakh S.S.R.

Effectiveness in prospecting and exploration in the Soviet Union has fallen and the number of deposits transferred to mining has been reduced in recent years. The ore reserves position is particularly low in all gold mining enterprises in Kazakhstan.

8 tons — Altai-zoloto Trust, Kazakhstan, (Kalba ridge) — 8 ore mines

—Altai (Altay) mountains of Southern Siberia (Alt means "gold" in Mongolian and Shar means "yellow".)

11 tons — Kaz-zoloto Association, Kazakhstan — 8 ore mines

The Bestobe mine in Kazakhstan—the deepest pit in the Soviet gold mining industry—is mining at 900 metres or lower in Tselinograd province in Kazakhstan.

Caucasus

Armenian S.S.R.

3 tons — Armenia — 1 complex, 1 enterprise

Open pit and underground

—Zod (ore mine) complex; Late start-up in February, 1976; at full capacity in 1980 — 3 placers

—Vertemi (ore mine) enterprise — 2 ore mines

—Stepanawan

Gold deposits are usually small but high grade. Location: about 70 miles from the Turkish border.

Output of the general Zod area is around 10 metric tons of gold a year.

Ural Mountains

Russian S.F.S.R.

10 tons — Ural-zoloto — 9 operations, 30 placers, 30 ore deposits

—There are gold mines at Berezov near Sverdlovsk and near Korkino, Chelyabinsk, south of Sverdlovsk.

—There is deep mining at Sverdlovsk.

—New gold deposits were found in the Urals in large quantities in the 1960's.

Plast and Kumak in the Southern Urals region are gold producers.

Several of the magnificent mansions built by prosperous 18th Century gold mine proprietors have been preserved.

By-Product Gold from Soviet Base Metal Mines
(only some of the larger recoverable gold outputs are shown)

	Gold Output Yearly (metric tons)
Kal'makyr porphyry copper mine, ore has 1 g. of gold per ton Uzbekistan, (23 million tons a year)	17.25
Kounrad porphyry copper mine, averaging 0.8 g. gold per ton of ore Kazakhstan, (14 million tons a year)	8.40
Gay copper and coper-zinc mine, 1.2 g. gold per ton of ore Urals, (6 million tons a year)	5.00
(eventually	6.70)
Almalyk Complex: Almalyk, underground lead-zinc mine Altyn-Topkan underground lead-zinc mine and Kurgashinkan open pit mine	2.70

—Almalyk, Uzbekistan, across the border from —Altyn-Topkan, Tadzhikistan and —Kurgashinkan, Tadzhikistan		
Ridder-Leninogorsk lead-zinc mine, Kazakstan		2.70
Kadzharan porphyry copper mine, 0.6 g. gold per ton of ore Armenia, (6 million tons a year)	(eventually	2.50 4.20)
Filizchay copper-lead-zinc-gold mine Azerbaijan		2.50
Pyshma-Kliuchevski copper-cobalt mines, 1 g. gold per ton of ore Urals		2.45
Sibay copper mine Urals		2.25
Achisay lead-zinc mines, 0.8 g. gold per ton of ore Kazakhstan		2.00
Ozernyy lead-zinc mine complex—may produce 4.5 tons gold a year from 1982. Irkutsk Oblast	(eventually	4.5)
Noril'sk Combine (Nickel, Copper, Platinum Group Metals, Gold), NW Siberia	under	1.0
Total Soviet By-Product Gold Output (recovered) is probably around 60 metric tons a year. 70 per cent recovery of the gold content of the ore is typical.		

Appendix II

ANCIENT GOLD SOURCES

Gold was almost certainly the first metal to attract the attention of man, because of the dazzle and allure of its brilliant appearance, its unalterability by corrosion—freedom from corruption—and its occurrence in the native condition in the ground.

Gold first began to be worked by man in any quantity about 6,000 years ago.

The Europeans, the Egyptians, the Mesopotamians, the Irish, the Spanish, the Portuguese, the Scythians, the Thracians, the Persians, the Ibero-Celts, the Greeks, the Carthaginians and the Romans each in turn exploited the gold ore of Europe, the Mediterranean, Egypt and the Middle East, as well as the Americas, in their desire for the lustrous yellow metal which made their rulers beautiful, wealthy and powerful.

The ancient civilizations of Bulgaria, Egypt, China, Ur, Babylon, Assyria, Minos, Greece, Ireland, Etruria and Peru valued gold highly and some of their beautiful gold pieces can still be seen on display in the great museums.

Gold is referred to in a majority of the ancient Hebrew, Hindu and Chinese manuscripts. Uses of gold mentioned in them were ornamentation of weapons, warhorse bridles, cups, idols, jewellery of all types, mummy coffins etc.

6,000 Years Ago

World's Oldest Gold

Ancient gold mining consisted, in essence, of surface or near surface workings.

Bulgaria

The world's oldest treasure of gold—uncovered in 1972—was found in Europe, (not Egypt, nor Babylon, nor Assyria, nor Peru.) Yes, Europe, in what is now Bulgaria, near the city of Varna on the Black Sea coast.

It is about 6,000 years old—certainly older than 3,500 B.C.—and comprises some 2,000 solid gold pieces, totalling 5.5 kilograms.

The Varna gold is probably traceable to the gold mines in the Transylvanian Alps of Romania and perhaps the mines of Mount Pangaion, Thrace, further south. The Varna treasure "culture" dates to a period about 6,500—4,000 B.C.

Precious metals are still mined and refined in the Apuseni mountains of Romania.

In ancient times Bulgaria was part of Thrace and (Roman) Moesia.

Invention of Metallurgy

Before prehistoric man could work gold, the art of melting and metallurgy had to be invented.

Many scholars are now convinced that the prehistoric inhabitants of the Varna region invented metallurgy before 4,000 B.C., well before and independent of the peoples of the Middle East. Tree ring and radiocarbon dating confirm this. The discovery of two prehistoric copper mines at Ai Bunar in Bulgaria and Rudna Glava in what is now Yugoslavia—both older than 6,000 years, support this also.

Another hoard of gold objects found at Vulchitrun, Northern Bulgaria, dates from 3,500 years ago.

Bronze Age

In the Old World, Eastern Hemisphere, the first period of metal use was based on copper and its alloys. Beginning in Europe and the Middle East after 2,000 B.C. and independently in Southeastern Asia at the same time, this technology spread among both peasant and urban societies. Bronze Age civilizations included Greece, Sumer, Egypt, the Indus and Shang China.

Iron began increasingly to replace bronze after 1,000 B.C. and it can still be considered as one of the world's most important materials.

Egypt

In Egypt, as early as about 4,000 B.C., gold was mined from shallow deposits by slaves, to be used in adornment of the kings and the wealthy. Gold collars were awarded to successful generals by the Pharaoh.

The Egyptian hieroglyph for gold was a collar of beads.

Narmer, the first king or Pharaoh of a united Egypt, about six thousand years ago, minted standard size, (14 gram), gold bars stamped with his seal, which may have been used as money. Narmer fixed a ratio of 2.5 silver to 1 gold. Gold rings, made to standard weights, were circulated in Egypt to facilitate trade as early as 2,000 B.C.

Under Menes, in Egypt, 5,200 years ago. gold was still two and a half times as valuable as silver.

The separation of gold from silver was not practised until around 2000 B.C. . The method of separating and extracting pure gold from the silver and other metals mixed with it was known at an early period in human history, perhaps as early as the second millennium B.C.

Nubian Gold

Nubian gold was essential to the Pharaohs and their diplomacy by royal gifts, just as Nubian soldiers were essential to the army of Egypt.

Most alluvial gold in Egypt was found in the Nile sands of Nubia, South of Egypt proper. "Nub" was the Egyptian word for gold.

Gold ore washing is depicted on the monuments of the fourth dynasty in Egypt, about 4,800 years ago. Lode gold was mined on the plateau between the Nile and the Red Sea.

Memphis

Egypt was famous for gold in the ancient world, "the metal of the sun". Ptah of Memphis was the patron god of goldsmiths and metalworkers, responsible for both the working of metals and the administration of justice. The ancient capital, later called Memphis by the Greeks, was known to the Pharaoh's subjects as Hutka-ptah, place of Ptah's spiritual double, which was transliterated by the Greeks as Aigyptos. Our word Egypt comes from it. The modern word is Misri. A wall-relief of 2300 B.C. shows the weighing of gold, refining, pouring of molten metal and the beating of gold into sheets.

Tutankhamun, historically a minor Pharaoh of Egypt of over 3,300 years ago, (but under whom the old gods were restored), was buried in a series of coffins, one within the other. Although Howard Carter discovered the tomb on November 24, 1922, the last coffin was not opened until October 28, 1925.

The third innermost coffin of the young Pharaoh, Tutankhamen, is wholly of solid beaten gold, 2.5 to 3 millimetres thick. 6 feet 2 inches long, it alone contained over 500 pounds of gold, according to Otto Neubert, page 210. (Jacquetta Hawkes says it weighs over 3,000 pounds of gold, page 367. Peter T. White says 244 pounds.) Desmond Stewart and his fellow editors in "The Pyramids and the Sphinx", 1971, say 2,448.125 pounds of pure gold.

At a modern price of about U.S.$600 per troy ounce, even 500 pounds of crude gold content, (ignoring the workmanship and the archaeological value), is worth U.S. $4.5 million. At a weight of 2,448 pounds, the gold is worth something over U.S.$20 million. Can one believe it? One coffin!

IT IS THE LARGEST ART OBJECT SURVIVING FROM REALLY ANCIENT TIMES.

Four remarkable miniature coffins of pure gold, each 16 inches high, containing the king's intestines, weigh over 30 pounds each. The total crude gold value of these four mini-coffins is about U.S.$1.06 million, at a modern price of $600 per ounce.

In Egypt, statuettes of gods were cast in pure gold.

The gold death mask on the mummy itself has been reproduced thousands of times and has been seen by millions during its tour of North America recently. The original is 22 inches high and 16 inches wide.

Tutankhamum was the only Pharaoh whose tomb was not plundered, as far as we know.

The atmosphere of those days in Egypt 35 centuries ago is brilliantly captured in the book "Child of the Morning" by Pauline Gedge of Alberta, Canada. One could add that Ruskin once said, "No great art ever yet rose on earth but among a nation of soldiers". One might add: "e.g. Ramses II of Egypt, Greece, the Thracians, the Anglo-Saxons, Charlemagne, Florence, Venice, the Russians, the Irish, the French, the Germans etc."

A Greek author, Agatharchides, who visited Egypt in the latter part of the second century B.C., gives a detailed description of the way in which gold was refined in a porous clay vessel. Diodorus Siculus travelled in Egypt in about 60 B.C. and wrote a similar account. The vessel, containing a lump of lead proportionate to the mass, lumps of salt, a little tin and a little barley bran, in addition to the gold ore, was tightly sealed with mud and then placed in a fired kiln for five successive days. By the end of this time the dross stuck to the sides of the container, while the pure gold collected at its centre.

From many passages in the Bible, e.g. Ezek. 22:21-23; Ps. 12:6, it would seem that this method, or one very similar to it, was also the one used in biblical times; see Is. 1:25; V. 7:17, 14, Zech. 13:8-9 for the use of gold refining as a metaphor of spiritual purification.

"Gold is the only thing that loses no substance by the action of fire. Indeed as a matter of fact it improves in quality the more often it is fired and fire serves as a test of its goodness."

—Gaius Plinius Secundus (Pliny the Elder)
AD. 77

4,000 Years Ago

Ireland

Irish prehistoric remains are particularly rich in gold. To look in a museum showcase and find yourself staring at an Irish solid gold collar, exquisitely worked, and to realize that it was made for the lucky wearer about 3,800 years ago, is a very humbling experience. How many of us today could prospect in the bush, obtain the gold, refine it and design and make such a beautiful collar without our modern aids.

The problems faced by the proto-Celtic peoples and the Celts in Central, Western and Northern Europe in those distant times were formidable:

1) The location, identification and mining of the gold-bearing and other metal-bearing minerals.

2) The processing by smelting and associated techniques to convert to pure metal—gold, silver, etc.

3) The casting, in sophisticated clay moulds, and the finishing of the object.

During the early Bronze Age, 4,000 years ago, Ireland became a major source of gold. Alluvial deposits in Southern Ireland were worked and ancient Irish records contain numerous references to gold. One major source was the allu-

vial or placer gold from the beautiful Avoca valley in County Wicklow. Being soft, it could be beaten into thin sheets. The goldsmiths of ancient Ireland obtained much of their gold from Croghan Kinsella there.

In the counties of Tipperary and Limerick in Ireland, gold vessels and ornaments have been found, as well as ladles, crucibles, etc. for working the gold—all from a period of 2,000 to 3,000 years ago. The skill and fame of the Irish goldsmiths was widely known. The people of Leinster province used to be called Laighnigh an Oir, (Lagenians of the Gold) since gold was first found there. Part of the Tipperary-Limerick area is still called the Golden Vale. The word for goldmine in Irish is oirmhianach, (pronounced ORVANA), which was used at least 1,800 years *before* the English language came into existence. From 'mhian', by itself, we get our English words "mine" and "mining"—from the old Celtic language.

By 1500 BC, the skills of metallurgy were firmly established in Ireland—producing copper weapons, gold ornaments etc. both for home and for export.

Ireland's collection of native prehistoric gold ornaments is unequalled in Western Europe. Some Irish gold jewellery pieces from almost 4,000 years ago and later have survived and may be seen in the National Museum of Ireland, the Royal Irish Academy and Trinity College, Dublin.

Examples of ancient Irish gold work which you can see in Irish Museums include:

Pair of gold discs diameter 11.6 cm.
about 2000-1800 B.C.

Gold lunula personal ornament diameter, at widest point 20 cm—7.87 inches 1800-1600 B.C.

Gold earrings, flanged diameter 3.6 cm
late 13th century B.C.

Gold torc, neck ornament diameter, at widest point 38 cm—about 15 inches 1200- 900 B.C.

Gold armlets 1200-1000 B.C.

5 early Celtic gold neck ornaments called torcs or torques were found in 1968 and are now in the British Museum.

The Celts conquered Ireland about 400 BC and they were great lovers of gold.

The bodies of Celtic leaders were buried with gold jewellery, rings, bracelets and torcs (neck-rings or collars) of gold, silver or electrum. The neck-ring was the most distinctively Celtic gold ornament. Their horses had gold ornaments also.

The Roman historian Dio Cassius records that, as she rode into battle against the Romans, Boudicca, (also spelled Boadicea), Queen of the Celtic people called Iceni in Eastern Britain, wore "a great twisted golden neckring", a torc.

Examples of Celtic gold work which you can see in European museums include:

A gold inlaid hilt on an iron sword—7th Century BC
Gold cup—late 6th Century BC
Gold ornaments—early 4th Century BC
Diadem of heavy gold, (from the head of a princess)—ca. 500 BC

Ireland's gold brought new settlers and trade with Britain and continental Europe. Neck and hair ornaments of sheet gold were exported to Europe.

Irish gold objects have been found in many countries in Europe and the Middle East.

Evidence exists that gold rings, made to standard weights and circulated to facilitate trade, found use in Ireland 3,600 years ago.

By 700 B.C., there was a very large amount of gold metal in circulation in Ireland.

The Irish skills in gold culminated in the exquisite complexity of both the Tara brooch (around 700 AD) and the Ardagh chalice (ca. 750 AD).

By 1436 AD, it was still being recorded: "Of sylvere and gold there is the oore (ore) amonge the wylde Yrishe".

The washing of gold at Ballinvally in County Wicklow, Ireland, continued until a hundred years ago.

In 1796 the finding of a gold nugget at Croghan Kinsella started a minor gold rush.

Julius Caesar, the Roman who led two expeditions into SE Britain in 55 and 54 B.C. reported that gold was in use by the Celts, the people who then lived there.

The earliest coins that have been found in Britain are not Roman, but pre-Roman Celtic (Gallo-Belgic) gold issues that had come over with the Celtic immigrants from the Continent a long time before the Romans.

Mesopotamia

("between the rivers", Tigris and Euphrates, which flow into the Persian Gulf, or Arabian Gulf.)

The people of the land between the rivers Euphrates and Tigris, now comprising most of Iraq, not only invented the wheel but over 4,000 years ago had learned to blend metals and to produce superb sheetgold jewellery and ceremonial helmets. Their cities were Ur of the Chaldees, where Abraham came from, Nineveh, Babylon, (Babel), Nippur, Nimrud, Kish and later Baghdad. We know them as Sumerians, Babylonians, Akkadians, Chaldeans and Assyrians. The ancient Semitic name of Babylon was Babili, "the Gate of the Gods".

Some alluvial gold came to Sumeria (Mesopotamia) from Anatolia, Asia Minor, (now Turkey). Small quantities of gold almost certainly came from Southern India and perhaps some from Caucasia, (now U.S.S.R.), western Arabia and the Yemen.

A gold tumbler and a gilded goat, both Sumerian, about 4,500 years old, (a thousand years *before* Tutankhamun), were found at Ur and are now in the British Museum.

Analysis of beads from a necklace found at ancient Ur showed that they contained an alloy of platinum-iridium-osmium. Further, there are platinum-iridium inclusions in two of the gold vessels and in nine pieces of Early Dynastic jewellery from the Royal Cemetery at Ur.

It is a very strange fact that the acclaim accorded an archaeological site is often commensurate to the amount of gold excavated from it. Look at Troy, Ur, Mycenae and Varna, Bulgaria. The public wants to know about the gold objects—almost to the exclusion of everything else. Wealth is the lure.

The Golden Fleece

The Golden Fleece (unshorn sheepskin), legend is the story of a Greek expedition, "the Argonauts" under Jason of Thessaly, about 3,100 years ago, say 1200 B.C., to seize gold which was being recovered from streams reputedly in Colchis, (now in the Soviet Republic of Georgia), on the East shore of the Black Sea, by laboriously washing the placer gold dust out from river sands with the aid of unshorn skeepskins. These were placed in crude water sluices, then dried and then shaken to dislodge the gold placer granules. The river was the Phasis, now called Rioni or Rion. The Rion lowland has luxuriant natural vegetation which is being replaced by intensive cultivation.

Realistic alternative explanations are a journey up the Danube to the gold-rich areas NW of the Iron Gates gorge, or the river now called Coruh near Batum (USSR) on the Black Sea, or the gold field near Trabzon, (Trebizond) in Turkey.

In Europe in the Middle Ages, the "cloth" at the end of a riffle board was usually a greasy sheepskin (fleece) which trapped the gold dust or nuggets.

A recent technique to collect gold in the Transvaal in South Africa utilizes blankets to the same thing.

Gold is the first metal mentioned in the Bible. Gold is also the most frequently mentioned of all metals in the Bible, but strangely enough almost no objects have been found of the six hundred years of the Israel period of Palestine (1200 to 587 B.C.). The Bible mentions Arabia, Sheba, South Arabia and Ophir as mine sources of gold.

The worshipping of gold images was not uncommon. The Judaeo-Christian bible describes how the children of Israel, who were escaping from Egypt under Moses, melted down golden ornaments they had brought with them and made a "golden calf", which they were worshipping.

King Solomon of Israel, who ruled 3,000 years ago, used gold profusely in the holiest place in the Temple, the inner sanctuary. The best estimate is that he was receiving about 18 tons of gold a year, a mind-boggling quantity. (Nowadays, at say U.S.$600 an ounce, 18 tons would have a value of about U.S.$350 million).

As the story goes, the Queen of Sheba gave Solomon a large quantity of gold—from the land of Ophir—120 talents, perhaps 3.25 tons, (nowadays say U.S.$62 million).

Where was Sheba? Where was Ophir? We do not know for-sure. The most popular current candidate for Sheba (Saba) is North Yemen and for Ophir, Mahd adh Dhahab now in oil-wealthy Saudi Arabia.

Central and Southern Africa are studded with ancient gold mines, but virtually no resulting gold art objects remain.

Large quantities of gold were concentrated in King Solomon's hands and were dedicated to the construction of the first Temple in 967 B.C. and his palace. That Temple was destroyed in 586 B.C. and 50 years later Cyrus of Persia returned some of the treasures:

> "30 chargers of gold: a thousand chargers of silver; 29 knives; 30 basons of gold; silver of a second sort, 410; other vessels 1,000. All the vessels of gold and silver were 5,400." Ezra 1:9 to 11.

The gold objects of the Temple of the Jews were brought, after the 3rd or 4th Century A.D., as spoils to Constantinople, but they then disappear from history.

Shekel

In the Middle East, a gold weight (or coin) called a "shekel", a standard unit of measure, (originally weighing 11.3 g), was in use long before the time of Croesus, (560 to 546 B.C.). Word derived from Hebrew "sagal", weigh; Greek "siglos". It became "siglos" in Persian. It is mentioned frequently in the Bible; developed as a standard weight of about 16.4 g.

In Babylonia, small pieces of gold, weighing 8.34 grams each, were known as shekels centuries before the Lydian "coins".

The shekel weight was one fiftieth or one sixtieth of a mina and one three thousandth of a talent.

The Mesopotamian "shekel" was 129 grains, based on the barley grain. The "mina" was 60 times as much. 60 minas went to the "talent", heaviest of the standard weights. A mina was about 1 pound in weight.

The Babylonians cast shekels in the shape of a sleeping duck and the Assyrians preferred the shape of a lion.

The "sealed shekel", a stamped piece of silver, came very near to being a coin.

Shekel: A Semitic unit of weight to measure gold and silver and later on a coin of that weight. Biblical references are to uncoined ingots. Abraham, around 1500 BC, paid 400 shekels to buy a burial site for his wife Sarah.

The Hebrew gold shekel weighed about 16.4 grams, each carrying a value of 13.33 silver to 1 of gold.

The alluvial gold of the Near East was usually electrum—a silver/gold alloy. Accepting a shekel was a gamble since the purity of the shekel (its gold content) varied from piece to piece. Pure gold was rare.

Shekel silver coins were first minted around 138 BC. In Roman times the shekel was not only a coin but a symbol of Jewish sovereignty under a Jewish king, albeit under Rome. However, by the time of Jesus, when he asked people to show him a penny, it was the image of Caesar on it that was his point.

The new unit of currency in Israel (1980) is the sheqel, (about 25 U.S. cents in value).

Much of the Middle East gold was electrum, a naturally occurring gold-silver alloy. Pure gold was rare.

Lydia in Asia Minor had always been a placer producer and was very rich in gold and electrum

The early Lydian coins are of electrum, a gold-silver alloy. Croesus reformed the currency and was the first to issue coins of gold as well as of silver, in the ratio of 3:40.

It was thought that natural electrum was always about a maximum of 30 per cent silver, but an electrum with 50 per cent silver, with a maximum of 50 per cent gold, occurs in the mines that were worked by the Romans at Nagyag, Muczari and Vicus Pirustarum in the Banat of Transylvania.

The weight of the coins from Lydia in the Temple of Artemis (Diana) at Ephesus are remarkably uniform at 4.7 g like the much later electrum coins of Lesbos and Cyzicus.

The source of the gold of the kingdom of Lydia in Western Asia Minor, was the river Pactolus, now called the Gediz or Sarabat. The gold was washed down from Mount Tmolus, now called in Turkish Boz Dag. The mythological King Midas, ruled Phrygia, which fell under Lydian domination. In the myth, he turned everything he touched into gold and filled the Pactolus river with gold flakes when he bathed in it.

Croesus, King of Lydia in the Western part of Asia Minor, (Turkey), replaced electrum, (gold alloyed to silver), coins with coins, (staters), of "pure" gold and coins of "pure" silver. Croesus, about 560 to 546 B.C., reputedly the richest ruler in Asia, issued at Sardis, the capital, two "coins", crudely shaped oblongs, one gold and one silver. These coins have platinum-iridium inclusions.

They were stamped with royal emblem—the heads of a lion and a bull facing one another. The stamp meant that the power and the wealth of the King of Lydia guaranteed the purity of their contents.

The early Greeks called electrum "white gold".

Gold/Silver Ratio

The ratio between the two was standardized by Lydia—thirteen and one-third (13 1/3rd) silver coins were worth one gold coin—an early gold-silver ratio.

Denominationally, gold was related to silver in a proportion of 1:10. Intrinsically, the ratio of value was 1:13.333.

The ratios between one metal and another in the Middle East had varied even before coinage came. About 2700 B.C. it was 1:9. Around 1800 B.C., under Hammurabi of Babylon it was 1:6. By the 6th Century B.C. it had gone to 1:12 and for centuries thereafter remained between that and 1:16, except in China, which had more gold, where it was 1:6. In the time of Sargon of Akkad, gold was 8 times more valuable than silver. In the records of Mari it was only 4:1. However for the greater part of the ancient history of Mesopotamia it was apparently 10:1.

In contrast, in Egypt, scarce silver was valued at times up to twice the value of gold. The Pharaoh Narmer, about 2600 B.C., fixed the gold/silver ratio as 2.5 silver to 1 gold.

A Celtic tribe, the Scordistae, in the Middle Danube region, now Romania/Bulgaria, were reported about 200 A.D. by Athenaeus as valuing silver above gold.

Following the discovery of America, the gold/silver ratio had become 1:14 by the end of the 16th Century A.D.

Persia (Iran)

Croesus and his country, Lydia were conquered by the Persians under Cyrus in 546 B.C. Cyrus adopted the Lydian bimetallic coin system. Cyrus of Persia captured Sardis, Lydia, and continued the bimetallic system with 1 gold coin equal to 20 of silver, 1:20. In building his palace at Susa, his successor, the Persian Emperor Darius, wrote about 2,500 years ago: "The gold was brought from Sardis (Lydia, Western Asia Minor) and from Bactria", (now Northern Afghanistan and Southern Uzbekistan and Turkmenistan, U.S.S.R.).

Under his successor, Darius, the Persian empire was vast—stretching from Greece to India. For this huge region, the Persian gold "daric" and the silver "siglos" (shekel) became the standard currency for this enormous region. Darius' portrait was stamped on the coins—a personal guarantee of the purity of the metal contained.

This Persian custom of rulers putting their own faces on coins, (and later on paper money), continues to this day. Customs are sometimes contrary. The British and Canadians use only *living* monarchs on the currency, but Americans use only *dead* Presidents.

The daric gold coin was not named after Darius, as the Greeks believed, but is derived from a Persian word meaning "gold"; in Middle Persian gold is called "zarig".

Cyrus and Darius allowed the Jews to build the Temple of Jerusalem.

Greece-Macedonia (Thrace)

The Persians preferred to buy out their enemies, rather than fight them. The Greeks, often victims of this technique, had a word for it, "Medizing"—an interchangeable word for

the Medes and the Persians, by then all in one kingdom. Later, Byzantium (Constantinople) used the same technique for centuries.

The Thracians, (and later the Greeks), worked the gold and silver deposits of the Mount Pangaean region of Thrace, Thrake in Greek. Greek-speaking Macedonia could not be bought because Philip of Macedon's wealth was based on the gold mines of Pangaeum and on the gold of the river Struma, both in a general area East of Pella, his capital, not far North of modern Salonika.

The systematic exploitation of northern Greek (Thracian) gold mines by Philip II made him wealthy and powerful.

The gold and silver mines controlled by Philip II also enabled him to drive the gold coins of the island of Cyzicus and the silver coins of Athens from the market.

The independent country of the Thracians, (who spoke a language only dialectically different to the Greeks but who had no writing), began to strike coins almost as early as the Greeks and displayed much artistic skill on them.

Philip of Macedon had conquered a part of Thrace including the Pangaean mines, by 341 B.C. He was murdered with a Celtic dagger in 336 B.C. His son, Alexander I of Macedon, conquered the Thracian Bisaltae tribe and adopted the native coinage, placing his own name on their coins. Alexander was taught by Aristotle, who was born in Thrace. Alexander made an accord with the Celts to secure his northwestern border.

Gold coins are not found in Europe until the coinages of Philip II of Macedon. (Silver was the currency of early Greece.) Philip II's gold stater was the first great gold coinage in the known world.

Alexander the Great

Under Alexander the Great, Persia was conquered in 330 B.C. Alexander's empire spread from Greece to Persia and what is now the southern Soviet Union with its gold and silver mines and the northwestern part of Pakistan and India.

Alexander regarded the known world's gold supply as his own personal property. He was not conservative in the minting of gold and silver coins and issued them lavishly to his friends and to the ever-expanding army.

Alexander died at the age of thirty-two in Persia. Alexander's body was sealed in a glass coffin and ENCASED IN GOLD and preserved in Alexandria, Egypt, the city he founded as his own memorial, but the tomb has never been located.

Permanency did result, however. Alexander's currency, the "staters" and "drachmas", became the FIRST TRULY WORLD-WIDE CURRENCY. The Macedonian gold stater, (Greek word for "standard"), had a weight of 2 drachmae and a value of 20 drachmae.

They were reliable and plentiful—accepted from the Nile in Egypt to the Indus river in India and from the Black Sea to the Indian Ocean. They stimulated and facilitated world trade.

There were vast issues of gold coins by Philip II, Alexander and Lysimachus, but, after their time, gold is struck less often (except in Egypt), until the Roman Emperor Augustus.

Rome

Conquest of the Etruscans in NW Italy gave Rome possession of at least some of the gold mine sources in the Western Alps.

After this period, mine production of gold shifted to Spain under the Carthaginians. Rome badly wanted these mines and defeated the Carthaginians in 206 B.C. and took them over. By the time of Christ, these Spanish mines were producing about 10 metric tons of gold a year.

The control which Rome began to exert upon the output of Spanish gold and silver mines was one of the greatest economic landmarks in Rome's long history.

up to 240 B.C.	*Gold* and *silver* mines in the Spanish mountains, worked by the Celtiberians, attracted various invaders and traders.
236 B.C.	The Semitic Carthaginians, (Carthage is now Tunis, North Africa), under Hasdrubal conquered the *silver* mines in the Sierra Morena, North of Cordova and Seville, Spain. The Romans increasingly coveted the *gold* and silver wealth of the Spanish mines controlled by the Carthaginians.
209-206 B.C.	Roman general Publius Cornelius Scipio, (Africanus Major), drives the Carthaginians out of Spain, (Hispania to the Romans), and presents himself to the Celtiberians as a liberator. The name of Carthage survives there today in Cartagena, (Carthago Nova = new Carthage). Many of the coveted Celtiberian *gold*, *silver*, *mercury*, *copper* and *iron* mines fell under Roman control.
197 B.C.	First Celtiberian revolt in Spain in the long struggle against Rome, which was to continue for a century and a half.
191 B.C.	Lusitanians (Celtiberians) fought the Roman army.
179 B.C.	Roman general Gracchus puts down another revolt in Spain.

148-137 B.C.	Lusitanians of Spain under Viriathus revolt against Rome for 12 years. Legion after legion of Romans vanished in the mountains.
146 B.C.	Carthage (Tunis, North Africa) was destroyed and the survivors enslaved by the Romans under general P. Cornelius Scipio Aemilianus, (Africanus Minor).
134-133 B.C.	Celtiberian fortress of Numantia, N.E. Spain, conquered by Roman general Scipio Aemilianus.
81-77-71 B.C.	Lusitanian revolt in Spain, (under Quintus Sertorius), put down by Roman general Pompey.
61-60 B.C.	Julius Caesar conquers Brigantium, (La Coruna), in Galicia, (the Gallaeci tribe), Northwest Spain, the last refuge of the Celtiberians. Northwest Spain meant gold.
19 B.C.	The final breaking of the 148-year Celtic resistance in Spain was not achieved until Augustus, 19 B.C., who needed three legions to garrison NW Spain.
30 A.D.	Spanish mines were producing about 10 metric tons of gold a year.

The Macedonian (Thracian) gold mines were reopened under the Romans about 150 B.C., but by the first century A.D. they were non-productive.

By this time, the Romans controlled the major gold mines of much of the known world—Spain, Macedonia, Dacia (Romania), Armenia etc. The Romans do not seem to have cared very much for gold ornaments. At times, Roman law required that Roman citizens were limited to wearing less than one ounce of gold each. In any case, the Romans were not outstanding gold workers.

DACIA (ROMANIA)

Near Cluj, (Klausenburg or Kilozsvar), at the village of Verespatak, considerable traces of Roman mining for gold are visible. The mine records were discovered (on wax tablets) in the early 1800's. The earliest metallurgy in Europe was in the Balkans, north and south of the Danube, in the 5th millenium B.C.—largely copper metallurgy, shifting to bronze in the late 3rd millenium. The Romans obtained a large amount of their gold from Transylvania—which has been a goldfield until quite recently—a province which is now part of the country of Romania. To the Romans, the area was part of their province of Dacia. The native Dacians opposed Rome from their capital of Sarmigetusa—a little south of Deva in Hunedoara.

The great gold treasure of Petroasa was transported to Moscow during World War One and has never been returned. It was of Hunnish or semi-oriental origin. It included two superb chalices of gold inset with large garnets with handles shaped like panthers, a large necklet, several elaborately based gold ewers and some superb torques. Torques, or torcs, of gold were worn by Celtic chieftains.

The Romanians themselves are partly the descendants of Roman merchants and Roman Army veterans who settled in Dacia and give the modern country its name, Romania. The Romanian physical type seems more definitely Latin than Italian.

Gold is "aur" in the modern Romanian language. In many respects, the Romanian language is closer to Latin than Italian is. It is based on a development of Vulgar Latin.

GOLD DEPOSITS AVAILABLE BEFORE CHRIST—EUROPE, EGYPT, NEAR EAST, CENTRAL ASIA AND URALS

1.
IRELAND
Gold, copper, galena, amethyst. A little tin.

2.
SPAIN
RIO TINTO
Massive copper sulphides with 0.5% As; 1% Pb; 3% Zn and Gold

CARTAGENA
Native silver. "Dry Silver" ores; galena. Gold behind Almeria with Pb; Cu; Zn, cobalt and antimony.

3.
ROMANIA/CZECHOSLOVAKIA THE APUSENI MOUNTAINS
The classic Roman gold mining area. Gold, silver, electrum, tellurium, arsenic, amethyst, red and yellow jasper. Sodalite at Ditro. The logical source of Shaft Grave precious metals, but no tin.

SCHEMNITZ
(Banska Stiavnica). Gold, silver with antimony, galena, arsenic, copper. Classic amethyst location.

KAPNIK
Gold, silver, lead, zinc, arsenic, copper and classic antimony area.

4.
GREECE
THESSALY
Gold, Mn, Pb, Zn, Ag, Cu and chromium.

5.
ASIA MINOR
Pactolus River, Sardis, Lydia (now Turkey).

6.
ARMENIA, Caucasus
(now U.S.S.R.) (Being worked again in the 1970's and 80's.)

7.
URALS
(now U.S.S.R.) Gold, platinum, malachite. Amethyst near Ekaterinburg. Sodalite. Osmium, iridium and palladium. (Still producing gold.)

8.
CENTRAL ASIA
(now U.S.S.R.) (Still a gold producer.)

9.
EGYPT
EASTERN DESERT
Ancient gold mines, copper, lead/zinc and tin.

NUBIA-WADI ALAQI
East of Abu Simbel. Ancient gold mines, copper with much nickel, chromium.

10.
ARABIA
HEDJAZ
Some 55 ancient gold mines have been located and their dumps worked. (New mines planned.)

The Roman gold coin was the "aureus". They were standard throughout the vast Roman empire.

"aureus", (aurum is Latin for gold)	gold coin, originated before Julius Caesar, first Emperor of Rome.	initially one-fortieth of a "libra" (a pound weight)—say 126 English grains per aureus. size: between modern U.K. sovereign and old U.S. 5-dollar piece.

(About 25 "denarius" 60-grain silver coins were the equivalent of 1 "aureus", but no effective ratios existed in the Roman Empire.)

The currencies in many of the *modern* Muslim world are *still* called "dinars", (from that name of the Roman coin), e.g. in Algeria, Tunisia, Libya, Jordan, Iraq, Kuwait, Bahrein, and South Yemen, as well as Yugoslavia, where part of the population is Muslim.

Constantine, declared Caesar by the army in York, England in A.D. 306, was the victor in the long civil war in Western Europe and undisputed master of Rome and the West by 312. Constantine I was born at Naissus, (now Nis in Serbia, Yugoslavia).

Constantine came out in favour of Christianity which enabled him to help himself to the treasures in the pagan temples throughout the Empire. (THIS PUT AMPLE STOCKS OF SILVER AND GOLD BULLION IN HIS HANDS.)

He defeated his last rival in the East in 324 and ruled as sole Emperor in the East and West.

The Roman capital was moved to Byzantium in 325 A.D. and renamed Constantinople after the Emperor. (It is now called Istanbul, the Turkish pronunciation of that name.)

By A.D. 268, the silver content of the denarius coin had fallen to 1/5,000th of its original level, no good silver or gold coins were in circulation—Gresham's Law—and inflation and subsequent state intervention in the economy had become so bad that poor men and rich prayed that the barbarians would deliver them.

The Roman Emperor Constantine reformed the currency, creating a new gold piece, the "solidus" or "nomisma" or "bezant", (from the old name of the city), containing 4.2 grams of gold (65 grains). The standard coin of the early Empire, the silver denarius, was progressively debased until between A.D. 324 and 360 it depreciated from 4,350 to 4.6 million denarii to the new gold "solidus" coin, one of the most stable monetary tokens in economic history.

Under the name "bezant," the solidus was accepted in trade from Africa across to China and from Ceylon to the Baltic and England. THE COIN RETAINED ITS FULL VALUE FOR NEARLY EIGHT HUNDRED (800) YEARS.

The weight of the "bezant" gold coin was significantly close to that of the Attic silver "drachma", the great unit of account in the ancient Greek world.

The bezant was famous for its extraordinarily high purity from the Fifth Century A.D. down to the Eleventh.

Constantinople was well placed to receive the gold mined to the east in the Caucasus, gold from Trebizond (now Trabzon, NE Turkey) on the Black Sea, from Central Asia and the Altai mountains, as well as from the Urals in the north-east and Nubia, Egypt and Ethiopia to the south.

In 444 A.D., the Romans stopped paying tribute to the Huns. In 447, Attila the Hun calculated the arrears as 6,000 pounds of gold, (say U.S.$43.75 million at early 1981 prices.) From 447 on, the Huns received 2,100 pounds of gold, (say $15.31 million), a year.

The amount of gold specie in existence during the peak of the Byzantine Empire, A.D. 716-817, was considerable. Compare:

The Byzantine Gold and Silver Hoard and Other Hoards of Gold in History

Pythius, (subject of Xerxes of Persia), contribution to the war, 480 B.C.	His private treasure of some 3.5 tons of gold
Booty taken from the Dacians (Romania) by the Emperor Trajan of Rome, A.D. 97 to 106.	250 tons of gold
Emperor Anastasius, on his death, A.D. 518.	160 tons of gold.
Theodora, on relinquishing power	55 tons of gold.
Byzantine Treasury assets: (during the regency of Theodora)	50 tons comprising 1,100 centenaries of gold and 3,000 centenaries of silver and 200 centenaries of gold in other items. Silver was valued at about 14:1 to gold.
The "roomful of gold" paid as ransom to Pizarro by Atahualpa, last of the Inca rulers in Peru, A.D. 1532.	6 metric tons of gold
Total gold extracted by Spain from Peru.	maximum 7.4 metric tons, estimated.
Gold produced and plundered by Spain in Mexico, 1522 through 1547.	30 metric tons estimated.
Gold collected and delivered by France to Germany to pay indemnity exacted by the Treaty of 1871, after the invasion of France.	83 metric tons

Famous German "War Chest", at outbreak of War I in August, 1914.	44 metric tons of gold.
Bank of England reserves, August, 1914.	less than 31 metric tons.

Gold was never scarce in Constantinople, (Byzantium). Great commercial activity over a long period of time both generated and accumulated great wealth.

However, gold became scarce in Western Europe around A.D. 700 and the scarcity continued until about A.D. 1200. Gold currency became impossible, causing a switch to silver, and even gold jewellery became very rare.

In the time of the Anglo-Saxon King Offa of Mercia, (d. 796 A.D. after a reign of 39 years), a new gold coin, a mancus, was introduced from Muslim countries—with a faithfully copied Arabic inscription. It resembled the Roman solidus, about 70 grains in weight.

Originally, in England, the word scilling (or shilling) seems to have been a word for gold coins—as distinct from silver—but with a disappearance of gold coins it came to denote a mere unit of account. Illustrating the shortage, the value of gold relative to silver was 10 to 1 at the close of Offa's reign, but it was 5 to 1 or 6 to 1 at the start of his long reign.

From the 9th to the mid-13th Century, gold was so scarce that, in the main, no gold coins were minted in Western Europe, but the gold bezants circulated all over the continent.

In England in the Middle Ages, the Exchequer rolls show that payments in "bezants" were the ordinary thing where gold was used. (Thomas Madox, History of the Exchequer, 1769.) Understandably, European princes and feudal lords rarely minted gold coins themselves.

A major cause of that scarcity was the commercial growth of the Eastern Roman Empire—unaffected by the collapse of the Western half. The importation of luxuries into Constantinople (Byzantium) escalated and had to be paid for in gold.

Debasement of the solidus by Alexius Comnenus in the 12th Century A.D. brought on the eventual end of the Byzantine empire in 1435.

When the Mongols invaded Northern Europe in 1241 under Batu's generals Baidar and Kadan, a large number of volunteers at the key battle of Liegnitz were Bavarian gold miners from Goldburg in Silesia under Boleslaw Syepiolka, armed with no more than the tools of their trades. The European army under command of Henry the Pious, Duke of Breslau, was destroyed in spite of the great courage of the Germans, the Poles etc. The gold lodes of Altenberg in Silesia contain copper.

The Mongols who conquered Kiev, then the greatest city of the Russian/Ukrainian speaking world, called it "the court of the Golden Heads" because of the golden domes of some thirty churches seen over its white walls.

Batu's army settled in Southern Russia and because of the enormous amount of gold loot collected was known as the "Golden Horde", (ordu, Mongol for camp, from which we get our English word 'horde'). The Golden Horde, or Kipchak khanate, was founded by Batu about 1242 A.D. and dominated Russia for 150 years, until the close of the 14th century. It was broken up by the conqueror, Timur (Tamerlaine) of Samarkand, into three Tartar khanates.

From about 1000 A.D. to the discovery of gold in Central and South America in the 1500's, most of the gold in Europe was obtained from the Alps, Siberia and the Gold Coast, West Africa. Much of the gold that Europeans obtained was used to buy spices and silk from the Far East, as well as embellishing churches.

Human suffering in ancient gold mines

It is somewhat shocking to realize that most of the gold that has ever been mined and which is still visible to human eyes has been the product of particularly brutal or at least distressing mining conditions in ancient Egypt, Nubia, Arabia, Spain and Romania, but also in the two principal modern source countries for gold, South Africa and the U.S.S.R. In South Africa, cheap black labour, recruited largely from tribes in neighbouring countries, has for decades provided the bulk of the work force in the world's deepest and hottest and most humid mines. In Russia and later the Soviet Union, conditions in the dreaded Siberian open river bed gold workings in the coldest region in the Northern hemisphere cannot be imagined and they contrast with those in the same country in the shallow open pit gold operations in the intense heat of the Kyzyl Kum desert in Soviet Central Asia.

Peru, Ecuador, Columbia, Panama and Mexico

The earliest gold work of this area known to archaeologists is Chavin. From about 900 B.C., the Chavin culture emerged, including arts like goldsmithing. The Amerindians used gold only for display. It was mostly of placer origin and nuggets could be hammered into sheet gold quite easily. This sheet gold could be cut easily with stone tools. The Chavin culture ended in 400 B.C.

The arts of working gold spread north from Peru to what is now Ecuador, Colombia and Panama. The Chimu, South American Indians, were famous for their gold ware and pottery. Their rule immediately preceded that of the Inca in Peru. Gold technology did not reach Mexico until about 980 A.D.

However, the cire-perdue (lost wax) process of casting gold had evolved in Mexico before the Spanish Conquest. Cire-perdue pieces are the finest examples of pre-Columbian gold work that we know of.

The Mixtecs of Mexico are considered today to have created the finest of all pre-Columbian gold work.

Over 400 years ago, the natives of the upper Amazon valley in South America made fish hooks and other artifacts from a gold alloy containing 1.4 per cent platinum. The Spanish found that much of the gold contained platinum and considered it an impurity and a nuisance—mainly because of its poor workability. Nowadays, of course, platinum is often more expensive than gold.

With Columbus's discovery of America came an unprecedented scurry for new gold deposits and millions of dollars worth of gold began to flow to Spain, Portugal, France and Britain. The feelings of many emperors, kings and explorers were revealed by King Ferdinand of Spain as he wrote to his men in South America in 1511: "Get gold—humanely if you can—but at all hazards, get gold".

In March, 1981, a 22.5 karat gold bar was discovered during excavations in Mexico City. It is presumed to be the only surviving gold from the famed treasure of Montezuma, the Axtec ruler, which was seized by Hernan Cortes of Spain in 1520. It is 10.4 inches long, 2 inches wide and 0.4 inches thick, containing 93.98 per cent gold, 5.24 per cent copper and 0.78 per cent iron. Cortes' lieutenant, Bernal Diaz del Castillo, wrote that the Spaniards took the gold art objects, pots, jewels etc. of the treasure and melted them down into bars a little over two inches across.

Great quantities of gold artifacts were melted down by the Spaniards and a great deal of this was captured by British privateers such as Drake in the Caribbean and the Atlantic. Even as late as the 19th Century Spaniards were still melting down old pieces.

The surviving pre-Columbian pieces in the Museum of Mankind of the British Museum, London, the famous Museo del Oro of the Banco de la Republica, Bogota, Colombia etc. are now worth far more than their mere metal value.

Appendix III

THE LANGUAGE OF GOLD

GLOSSARY OF TERMS IN THE WORLD OF GOLD

Absorption (Industrial and the Arts) — amount of primary gold used in fabrication by domestic industries (jewellery, electronics, dental, etc.)

Actual — physical commodities, as distinguished from futures contracts.

Agio — word used in English since 1682—an Italian word for "accommodation".

means the percentage of the charge made or premium, for the exchange of one form of precious metal for another form. It can also express the difference in point of value between one sort of metallic money and another.

Alluvial Gold — placer gold, formed by the weathering of gold-bearing rocks and deposited downstream by rivers and streams.

Amalgam — an alloy of mercury with gold or other metals that is solid or liquid according to the proportion of mercury present. Most are solid. Used especially in making dental cements. Amalgams of some noble metals occur naturally. A gold amalgam is obtained from the platinum region of Colombia.

Arbitrage — simultaneous purchase of commodity futures in one market against the sale of futures in the same, or more typically, a different market in a riskless transaction in order to generate a profit by the price difference, (spread, straddle). A typical "arbitrage" is a purchase on the London Metal Exchange and a matching sale on the Commodity Exchange, New York.

Aside — out of the market, by choice, or "aside".

Assaying — Method of chemical analysis for determining noble (precious) metals in ores.

Assay Ton — the weight in milligrams of precious metal obtained from (1) "assay ton" (AT) of ore gives directly the number of troy ounces to the net ton. The assay ton, (29.167 g.) used in assaying, bears the same relationship to the milligram that a short ton of 2,000 pounds avoirdupois bears to one (1) troy ounce.

Aurum Reginae — Queen's gold. A royal revenue belonging to every queen consort during her marriage with the king.

Authenticity — the actual gold content in any lot in hand, authenticated by a reliable seller.

Backwardation — the term used to describe a market situation where the price differential between nearby and forward, far out quotations when the near dates are priced at a premium because of tight supply. It is paid for delay in the delivery of the material contracted for, when the price is lower for time than for cash. Backwardation is the opposite of Contango.

Banket — "almond cake" in the language of the Boers. The gold-bearing area in South Africa was studded with rock of fused pebbles which resembles such a cake. The gold is found thinly spread in banket—a layer of conglomerate rock that resembles grey asphalt.

Basis — 1) Difference between spot or cash price and the price of the futures contract.

2) The grade of a commodity used as the standard of the contract.

See Gold Spreads.

Bear — one who believes that prices will decline.

Bear Spread — sell front month, buy back month, when market expected to change from backwardation to contango.

Billion — A mixed metal used in coinage consisting of gold or silver, but with a preponderating admixture of a base metal, usually copper or tin.

Break — a rapid and sharp decline in prices.

Bulge — a sudden advance in prices.

Bull — one who expects prices to rise.

Bull Spread sell back month, buy front month, when market expected to change from contango to backwardation.

Bullion word used in English since 1451

means fine gold or silver in the lump, or in bars or plates, refined or partly refined, as distinguished from coin or artifacts. Usually, 995 to 999 purity. Word literally means "melting house". The term is often applied to coin.

Bullion Coins Coins containing usually less than 995 purity but contain sufficient fine gold to substitute for bullion.

Buying Hedge see Hedging

Carat and Karat The name carat comes from a Greek word for the carob seed, formerly used as a uniform weight.

THERE ARE TWO *QUITE DIFFERENT* CARATS:

1) a measure of weight, e.g. a 10-carat diamond;
2) a measure of purity or fineness *in gold*. Totally pure gold is called 24 carat, (also spelled *k*arat).

Carat and Karat—Definitions

1) As a unit of weight or mass for weighing precious stones, a carat is equal to 200 mg. (0.2 gram) or 3.086 troy grains—also called a "metric carat" or "international carat" since 1913. The old carat was about 0.2053 g. (3.17 troy grains) and often ranged up to 3.33 troy grains. A carat is divided into 100 "points". Some jewellers divide a carat into four parts called "diamond grains". The U.K. symbol for "metric carat" is CM. 5 carats equal 1 gram.
2) In the measure of purity of gold, to denote the quality of the metal, pure gold being 24 karats or carats, which equals 100 per cent purity; 18 karats equals 75 per cent pure gold; 9 karats equals three eighths pure. Usually spelled karat in the U.S.A. (See *Karat Gold:* alloyed gold used in jewellery.)

Carrying a general term covering both "borrowing" and "lending".

Carrying Charge Market see Contango market or Normal market.

Carrying Charges the costs involved in owning mineral commodities over a period to time (warehouse storage, insurance, interest).

Cash Commodity physical merchandise available for delivery within a designated period—a commodity bought or sold to arrive.

Catalyst a chemical (metal) which assists a chemical reaction but remains chemically unchanged at the end of the reaction.

Chaos Hedge see Gold Investor

C.I.F. cost, insurance and freight paid to destination, (included in the price).

Coloured Golds Karat (alloy) golds of various colours and shades can be obtained by alloying other metals with fine gold.

Comex abbreviation for Commodity Exchange Inc., New York, a hedge market for precious metals etc.

Concentrate the ore of a metal after separation from other unwanted minerals.

Consumption (Apparent) amount of "fabricated" gold purchased by a country's residents domestically or abroad.

Contango a term that refers to a particular futures market situation, i.e. the price differential when near dates are priced lower than forward, far out, quotations. It is in effect the rate of interest or carrying charges on the physical gold that this represents that is called a contango. Contango has been the normal situation found in precious metals futures markets during the past few decades of inflationary environment. Contango is the opposite of Backwardation.

Contract Grades the grades of a commodity listed as suitable for delivery against a futures contract.

Custom Smelter a smelter or smelter-refinery which takes in concentrates, scrap or blister either purchased from or on toll for independent mines (not owned by the smelter) and which returns an agreed percentage of these materials as refined metal shapes, (bar,

	slab or ingot). The custom smelter's profit is in his charge for this service less his costs, but he also "gains" any recovered metal which is surplus to the "returnable" amount under the contract.
Deferred Contract	one of the more distant months in which futures trading is taking place.
Delf	a mine or quarry, (Old English).
Delivery	the tender of the actual commodity against a short position in futures during the period allowed by the futures contract.
Delivery Month	the calendar month in which the futures contract matures and within which the delivery of the physical commodity is stipulated.
Dental Gold	usually 16 or 20 karats, (62.5% or 83.3% gold).
Differentials	premiums paid for grades better than the basic grade or discounts allowed for lower grades.
Doré Bullion	an impure alloy of gold and silver produced at a mine.
	From French, 'gilded'; Latin deaurare (de-aurum). Aurum means "gold".
	A crude alloy of gold containing a significant amount of silver.
Drachma	Name for certain ancient and modern Greek coins. Originally small iron skewers.
Ductility	property or quality of metals, alloys etc. by which they may be beaten into sheet or drawn into wire or extruded without rupture or loss of strength. (Gold is the most ductile metal at normal temperatures.)
Electrum	argentiferous gold—a very pale yellow natural alloy of gold containing up to 40 per cent silver, occurring naturally as gold ore, although authorities differ on this number.
	The colour ranges from pale yellow to pure white depending on the amount of silver present.
	It was regarded by the ancients as a white variety of gold, which is near the truth.
	(Early samples of platinum were thought to be electrum.)
Evening Up	buying or selling to adjust an open market position; also called "offset".
Fabricated Gold	worked gold
Face Value	or nominal value. Value of a coin fixed by the country of origin for use as legal tender.
Filigree	delicate tracery in fine gold or silver. Consists of silver or gold wire soldered in patterns on a background.
Fine Gold	gold grain or bullion or specified quality, (e.g. 995 parts gold per 1,000.) Pure gold is 24 carats. There is virtually no such thing as 24 karat jewellery. It would be far too soft and would wear away.
Fineness	Fineness is the measure of gold purity, measured in karats, or the weight fraction of precious metal contained, expressed in 1,000ths in jewellery alloy applications. 24 karat is pure gold. An 18-carat gold alloy might be described as of 750 fineness, i.e. 750/1000ths., (18/24ths.), is precious metal.
Fine Weight	Weight of gold contained in a coin, determined by multiplying the gross weight by the fineness.
Fix	see Goldfixing
F.O.B.	free on board—all shipping costs paid up to the point at which the shipping conveyance leaves for its destination.
Forward Metal	gold contracted for delivery at some forward or precise future date.
Futures	a contract which requires delivery of a commodity at an agreed future date, at an agreed price, negotiated on a public commodity exchange, i.e. a hedge or futures market.
Futures Exchange	membership organisation involved in public trading sessions in commodities listed for trading.
Gild or Geld	money or tribute in Saxon law.
Gilded Gesso	gesso is a paste of gypsum and glue used to prepare surfaces for painting or gilding or used to cover imperfections on a wood surface and then gilded.
Gilding	to cover or overlay with a thin layer of gold which is then said to be

"gilt". Also meant "to pay taxes": "This town, Ilfracombe, in the Confessor's days, guilded after one Hide, and one Farthing of Land."

Gilding Metal — an alloy composed of 4 parts of copper, 1 part of Bristol old brass and 14 ounces of tin to every pound of copper.

Gilt — covered or overlaid with a thin coating of gold—gold laid on the surface.

Gilt-jeweller—one who specializes in such gilding.

Golda — a "mine" (Old English)—Blount.

Goldbeaters Skin — the traditional material for goldbeaters skin used to produce "gold leaf" is ox-gut, a layer of the caecum or blind gut of the intestine. The fine gold is placed between two laminated layers of ox-gut which have been specially varnished and then the beating commences, continuing until the gold leaf is only 0.1 micron thick.

This ox-gut was probably never produced in the U.S.A. Prices were steep. The use of ox-gut in goldbeating was given up in the States many years ago. There were very few goldbeaters left. It is a difficult skill. Nowadays, cellophane or glassine is used.

The largest firm of goldbeaters in the world was M. Swift and Sons Inc. of Hartford, Connecticut. They still had some ox-gut available in 1970 and could supply the cellophane or glassine.

Gold Bullion — fine gold in bar form.

Gold Certificate — certificate attesting to a person's ownership of a specific amount of bullion paid for, in store.

Gold Coins — see Index

Gold Dealer — synonym for a member of the London Gold Bullion Market

Gold Delivery Bar — a 400 ounce (12.44 kg.) bar of fine gold.

Gold Exchange Standard — Device evolved at the Genoa monetary conference, 1922, after the collapse of the Gold Standard during World War I, to maintain the stability of currency exchange rates. Under this system Central Banks redeemed their currency not in gold, as before, but in a currency that is convertible into gold. The system collapsed 1931-33, but was revived after World War II and during the period 1958-71 most European treasuries adopted this approach, treating the U.S. dollar as the main unit in which the accumulated reserves.

Gold Filled — "Gold Filled" in Canada and the U.S.A. is a layer of 10 karat gold or better mechanically bonded under heat and pressure to one or more surfaces of a supporting base metal alloy, then rolled or drawn to a prescribed thickness. In the U.S. jewellery industry, the quantity of karat gold must be at least 1/20th by weight of the total metal content.

If it is less than 1/20th, it is "rolled gold plate". See "Rolled Gold".

Under U.S. regulations, a jewellery product fashioned of "gold filled" material may be marked, described or advertised as 14, 12, or 10 karat gold filled, ("gold fill"). See "rolled gold".

Gold Fixing — London market announced twice a day.

Gold Investor — person convinced that part or all of his assets should be in the form of physical bullion or gold coins.

Gold Leaf — Thin gold foil produced by beating gold ribbon placed between vellum and animal skins until the gold leaf is only 0.1 micron thick.

Goldeminge — the old name for Godalming in Surrey, southwest of London, England.

Gold Spreads — see Bull Spread, Bear Spread Monetary system in which the value of currency in issue is legally tied to a certain quantity of gold. During the last quarter of the 19th century virtually all major trading nations adopted this policy and most attempted to return to it after the break caused by World War I. This attempt was abandoned, in all important cases, with the onset of the world economic slump in 1931.

Gold Standard — A country is said to be "on the gold standard" when the standard unit of its currency is defined by law as a

	fixed quantity of gold and when its currency is freely convertible at home or abroad into that quantity of gold. Most countries have sharply modified versions of the gold standard.
Good Delivery bar (or "good London delivery bar")	the standard gold bullion bar that is traded internationally, weighing 350-430 troy ounces (12.44 kg. mean) bar of fine gold, minimum 995 parts per 1,000 fine gold. The "free market" price is paid on the gold content only, basis 1,000 fine.
Grades	standards set for judging the quality of a metal or commodity.
Grain (gr)	fundamental Anglo-Saxon unit of weight in the avoirdupois, troy and apothecaries systems.
Gram (g)	fundamental unit of mass in the metric system.
Gross Weight	the total weight of a coin or of bullion.
Guinea	a gold coin formerly issued by the English Mint. The gold came from Guinea. They were all called in during the reign of William IV, (died 1837.) Value: 1.05 pound sterling.
Hall Mark	A protection for the consumer of gold or silver; the official mark or stamp used by gold and silversmiths in England and Ireland in marking gold and silver articles assayed by them.
Hedge (Hedging)	hedging is the sale of futures against the purchase of inventory of actuals, or the purchase of futures against forward sales of the physical commodity as protection against a price advance. It reduces the risk, protecting the needs of a company or individual from price fluctuations.
Highgrading	the practice of stealing gold or other valuable ore, in mining vernacular.
Inverted Market	synonym for Backwardation market.
Isotope	Greek for "same place", (same position in the periodic table of the elements). Isotopes are varieties of atoms of somewhat different atomic weight in most elements. Such elements are mixtures of different isotopes. Rhodium has one stable or semi-stable isotope, Rhodium 45/58, like Gold, 79/118.
Jewellery Gold	Ranges from 9 to 22 karat (37.5% to 91.6%), (see karat gold).
Karat	see Carat
Karat Gold	Karat gold is gold alloy used in jewellery and is designated by a karat number. Pure (Fine) gold is too soft to use in jewellery. It would wear away too quickly. The addition of other metals to gold, forming alloys called "karat gold", adds strength, hardness and/or colour and other desirable physical qualities. Fine gold is 24 karat, (commercially 99.9% pure). The most popular "karat golds" are 22, 18, 14, 12, 10, 9 and 8 karat. "22 karat gold" consists of 22 parts fine (pure) gold and 2 parts other metals. "18 karat gold" equals 75 per cent fine gold, 25 per cent other metal. It consists of 18 parts fine (pure) gold and 6 parts other metals, frequently 3.6 silver and 2.4 copper. "14 karat gold" is a 58.3 per cent gold alloy containing 14 parts fine gold and 10 parts other metals; popular in Continental Europe for wedding rings. The most popular quality in the U.S. "12 karat gold" is 12 parts fine gold and 12 parts other metals; and "10 karat gold" is 10 parts fine gold and 14 parts other metals. In the U.S.A., no quality of less than 10 karat, with its allowable tolerances, may be described as karat gold, or even be called gold at all. "9 karat gold" is the legal minimum in the U.K. and Ireland and is exported to Canada. "8 karat gold" is legal in Germany. The Italian market prefers 18 karat gold jewellery. The legal minimum that can be called gold in France and Italy is 18 karat (750 fine). The U.S. and Canadian market generally prefers 14 karat gold jewellery. The legal minimum that can be called gold in the U.S.A. is 10 karat.

The U.K. market provides 9 karat gold jewellery. The legal minimum in Canada and the U.K. is 9 karat.

The West German market prefers 8 karat gold jewellery, which is the legal minimum there.

22 karat is the permanent favourite in the Middle and Far East.

Kilo Bar — a 32.15 troy ounce bar of fine gold (1.00 kg.)

Lakh — means a quantity of 100,000. Used in silver trading for convenience, e.g. 'I want 1 lakh' means I want to purchase 100,000 ounces of silver.

Laminated Gold — gold laminated onto a base metal.

Lator — gold coins of the former Latin Monetary Union (LMU) of 1862. Term used mainly for Italian or Belgian coins of nominal value, 20 lira or 20 Belgian francs.

Liquidation — closing out of a long position in contrast to covering, which refers to closing out a short position.

Lode Gold — Lode gold is gold which occurs in a vein. A "reef" is a lode of gold-bearing quartz. "Lode" is a line or aggregation of metal or mineralized rock in veins or ledges in a continuous belt or zone embedded within the solid quartz or other rock "in place" where it has been deposited. The areas in this country and the U.S.A. that are at all likely to contain valuable lode deposits of gold have already been explored so carefully and thoroughly that the prospector without ample capital has very little chance of discovering a lode rich enough to be worth developing. (Compare the words of lodestone; lodestar.) "Lode" is from the Old English "to lead".

"They have now two kinds of Tynne workes, Stream and Load. When they light vpon a smal veine, or chance to leese (lose) the Load which they wrought,—they begin at another place neere-hand and so drawe by gesse to the main load againe."

—Carew, "Cornwall," A.D. 1602

Long — a trader whose net position shows an excess of purchases over sales; referring to a cash or futures position.

Margin — an amount deposited by investors as buyers or sellers of futures contracts to ensure performance on futures contracts commitments. Margins usually average about 5 per cent of the dollar value of the contract. (Serves as a performance bond and *not* as a down payment.)

The holder of the contract has to provide promptly the difference between the current market price and his contract price by paying "variation margin" differences.

Margin Call — a commodity broker's request to an investor/client for additional money to add to and secure the original deposits.

A margin call is triggered by adverse price movements before the contract's delivery date.

Mark — originally a measure of weight—variable, but approximately 8 troy ounces of gold or silver—throughout Western Europe.

In England the mark was money of account *only*, brought in under Danish rule. After the Norman Conquest it was equal to two-thirds of a pound sterling, 160 pence. 20 pence was equal to one troy ounce of silver. 12 ounces equalled 240 pence, one pound of silver, i.e. one pound sterling. The mark (merk) Scots was a silver coin from 1570.

The new 1873 German mark, replacing the thaler (dollar), was a silver coin, based on gold. The mark remains the currency in Germany, (the rentenmark, reichsmark and the deutschemark in this century.)

The Ransom paid for the release of King Richard Coeur de Lion (Lionheart) of England in 1194 was 100,000 marks. The ransom weighed 35 metric tons. Richard died in France at the age of 42. He was King of England for 10 years.

Mercantilism — Economic theory much favoured in the 16th and 17th Centuries, under which a country's prosperity was held to depend on its success in ac-

	cumulating gold and silver reserves. It favoured strictly limited imports and aggressive promotion of export trade.
Mercex	abbreviation for the New York Mercantile Exchange, a hedge market for precious metals, etc.
Mine	word of Celtic origin; the old word "meini", meaning ore or metal, from which the modern Welsh word mwyn (ore or mine) is derived and the Irish méin.
	Royal Mine or Mine Royal—in English law, any mine yielding more gold and silver than will cover the operating costs. The law in England has followed Roman imperial law concerning gold and silver mines. Mines Royal are the exclusive property of the Crown, i.e. the government; (until 1760, the King of England himself). Virtually all gold and silver mines in the U.K. are in the Celtic areas—an interesting coincidence.
Minerals	"minera" in Latin means ore or a mine. Naturally occurring substances obtainable by mining.
Mint	(see Money)
Mint Mark	mark on a coin—often too small to read—which identifies the Mint at which it was struck
Money	"Moneta" in Latin. Originally the name of a goddess in whose temple at Rome money was coined—hence our words "money" and "mint".
Nearby Delivery	the nearest active traded contract month of delivery on a commodity futures exchange.
Nominal Price	declared or estimated price for a futures month used to designate a closing price when no trading has taken place during the final few minutes of the trading session. Usually the average between the last bid and the last asked price.
Normal Market	(see Contango market)
Notice Day	a day when notices of intent to deliver on futures contracts may be issued.
Offset	(see Evening Up)
Open Interest	the total number of "open contracts" recorded on the books of a commodity exchange. It refers to unliquidated purchases or sales and *never* to their combined total.
Open Outcry	oral declaration of each trade or an organised futures exchange.
Or	signifies gold in heraldry, (from the French).
Ormolu	a golden coloured alloy of copper and zinc or brass used to imitate gold. Ormolu is used in decorating clocks, furniture etc. From the French "or moulu" meaning "ground gold". It is often gilded by brushing with gold amalgam and firing.
Out of Line	generally used when an order cannot be executed on account of difference in price level between the order and current market prices.
Pegged Price	price at which a commodity has been fixed by agreement.
Pennyweight	the pennyweight is a unit of measurement of weight, (one-twentieth of a troy ounce). It consists of 24 troy grains.
	There are gold karat alloy "pieces" in the dental world in North America which are sold by the pennyweight, (dwt.), and which are occasionally loosely called "gold Pennyweights". There is a long list of the various combinations of the specific gravity required in the alloy, the thickness and the size of the piece. As a completely random example, a "piece" of such an alloy could be from .002 mm. to .001 mm. thick and say 12 mm. square.
	In the jewellery field, 18K to 14K gold is sold by the pennyweight either in grain form or in sheet of about 3.175 mm. thick, which is easily cut up into pieces.
Pit	1) The place on a North American commodity exchange floor designated for the execution of futures orders for a specified commodity, such as gold. Known as a "ring" in London, England.
	2) Old English word for a mine and still used for deep shaft mines there. Used in North America in a limited way, as in "sand pit".

Placer Gold (or Gold Alluvial Gravels)	a Spanish word from Catalan used in English in mining. Placer consists of all forms of mineral deposits which are loose and *not* "in place", i.e. excepting veins, lodes or ledges. It is a concentration of some sought-after natural material carrying one or more of the precious metals that has accumulated alluvially in the unconsolidated sediments of a stream bed or sea shore through the process of weathering or erosion. Heaviness and resistance to corrosion make platinum and gold ideal substances to accumulate in placer deposits close to the source rocks from which they have come. In addition to these properties, the bright characteristic yellow colour of gold and the shine of platinum, easily recognizable even in very small amounts, make recovery by gravity separation feasible. ALMOST EVERYONE HAS SEEN MOVIES OF THE OLD TIMERS "PANNING" FOR (PLACER) GOLD IN THE STREAMS OF THE KLONDIKE IN THE YUKON, CANADA. PLACER IS STILL RECOVERED FROM THE JUNGLE STREAMS OF COLOMBIA. In the Yukon, Canada, in Alaska and in the Siberia/Far East Regions of the Soviet Union, the gravels containing the gold placer are perennially frozen and nowadays are thawed out by steam jets or wood fires.
Platinum	a silver-white metal that was used as an adulterant for gold a century ago, but is now more valuable than gold.
Primary Gold Metal	a term which refers to unworked gold, usually bullion or grain, newly won from mining operations.
Purity of Gold	usually expressed as parts of 1,000, so that a "fineness" of 800 means 80 per cent gold.
Purple of Cassius	hydrated stannic oxide containing finely divided gold. It has been used for centuries for preparing purple glass and enamel.
Reef Gold	in which the gold metal is embedded in a matrix. A reef is a line or ridge of rock below the surface.
Reserve	That portion of a resource that has been actually discovered but not yet exploited and which at present is technically and economically feasible.
Rolled Gold	gold-clad copper is defined in Canada and the U.S.A. as "rolled gold" if the gold in this surface alloy is less than 1/20th of the total weight of the metal. It is sometimes referred to as "gold plate" or incorrectly as "gold filled". It should be identified as such either as "R.G.P." or as a fraction indicating the quantity of gold, (1/40 12k RGP).
Round Turn	the completion of both a purchase and an off-setting sale or vice versa.
Royalty	a share of the gross money receipts or the profits due to the King or government ("Crown royalty" in Canada), or to an owner of mineral rights for the right to work them.
Secondary Gold Metal	gold recovered from recycling scrap etc. A term which refers to gold obtained from the processing of scrap, slimes, sludges etc. which contain gold. A significant portion of the gold supplied to the market place is "secondary" metal.
Selling Hedge	See Hedging
Semi-fabrication	production of gold or other metal or alloy in the form of wire, sheet, rod etc.
Short	a trader whose net position shows an excess of sales over purchases; referring to a cash or futures position.
Skillet	a thick sheet of low carat gold.
Smelting	process of extracating crude metal from its ore or concentrate by heat prior to refining.
Sovereign	an English sovereign (1 pound sterling) gold coin in 22 carat (91.6% gold, 8.3% copper).
Specie (Espèces, plural; numéraire; in French)	Metal money, (legal), usually meaning "of gold or silver"; Metallic currency; Money in the form of coins. Gold sovereigns (U.K.) are specie, for example, (if genuine.)
Spot Gold	the going price of gold in the cash market.

Stater — an ancient weight and coin, reputedly half an ounce. Greek word 'stater', to weigh.

Sterling Silver — silver of a fixed standard of purity, usually defined legally as an alloy of 925 parts of silver with 75 parts of copper.

The world sterling was used in Anglo-Latin as early as 1180 and in English in this sense from 1488.

Stope — step-like excavation underground for the removal of ore; Old English "staepe", meaning step.

Strong Currencies — currencies that reflect economies of countries in better condition than that of the U.S.A., e.g. Swiss, German and Japanese.

Tael Bar — used in the Far East and equal to 1⅓ troy ounces gold. Bars are usually in 1, 5 or 10 tael units.

Ten-Tola Bar — a bar of fine gold 3.75 ounces troy or 116 grams.

Toll — the charge for the service provided by a custom smelter, q.v., which is paid by a supplier of mineral concentrates, scrap or blister, usually an independent mine. The service rendered is the conversion of the concentrates and their return as metal in a saleable form.

Toll Refining — in toll-refining, scrap material, concentrates etc. are sent to a refinery, refined for a fee and returned to their owner without any change of ownership.

Trading Limit — 1) Maximum price change permitted for a single session.

2) The maximum number of futures contracts which may be traded by a speculator during a single session in any given commodity.

Trading Volume — see below

Vermeil — a layer of gold, usually electroplated, at least 100 millionths of an inch thick, covering an object of solid sterling silver.

Sterling silver covered with a thin layer of gold; silver gilt, gilt bronze.

Volume of Trading — number of contracts traded during a daily session. A purchase and sale equals one trade.

Warehouse Receipt — see Warrant

Warrant — the document of title issued by a bank or a warehouse registered on a metal commodity exchange such as the New York Mercantile Exchange which shows title to the precious metal stored physically in the bank. It is usually endorsed in favour of the person named on the document or is made out to "bearer". It describes the brand of metal, the refiner, the weight, the number of bars etc. See Warehouse Receipt.

White Gold — normally contains either 12% Palladium or 15% Nickel.

Witwatersrand — "ridge of white waters" in the Dutch-origin language of the Boers. Gold bearing region near Johannesburg.

MULTILINGUAL GLOSSARY—GOLD MINING AND USES

	French	Spanish	German	Russian	Serbo-Croat (Yugoslavia)	Greek
Gold	or	oro	Gold	zoloto	zlato	chryso
Gold Bullion	1) lingot d'or 2) bouton d'or	1) oro en barras 2) botón de oro	1) Goldbarren 2) Goldkönig	sleetok zolotom	celicni blok zlatom	
Gold Placers	1) gisements d'or 2) placers aurifères	placeres de oro	Seifengold-Vorkommen			
Gold Dust	1) poudre d'or 2) poussière d'or	polvo de oro	Goldstaub	pilye zolotom	prasina zlatom	
Gold Plating	placage d'or	dorado	Goldplattieren	plakirovanye zolotom	plakiranje zlatom	
American Gold	or americain		Amerikanisches Gold		americko zlato	

Weights and Conversions

Troy Ounce—a measure of weight for gold, silver and precious stones. Also: 24 grains = 1 pennyweight; 20 pennyweights = 1 ounce; 32,150 troy ounces = 1 metric ton.

The price of gold is still quoted in U.S. dollars per troy ounce. The troy ounce is still in use as the unit of weight for precious metals and precious stones in many of the English-speaking countries. Weighings of precious metals are made in multiples and decimals of this weight and since 1853 must be used in the U.K. for the sale of platinum, gold and silver articles. It gets its name from Troyes, a city in Aube, France, 80 miles SE of Paris, famous for its medieval trade fairs. The obsolete troy pound was equivalent to 12 troy ounces.

A troy ounce is equal to an Apothecaries' ounce.

Continental Europe, Russia, Japan, Latin America and other countries use metric weights for precious metals expressed in grams or kilograms. Australia and the U.K. are in the process of going metric and Canada may.

It appears that price quotations for precious metals—universally U.S. dollars per troy ounce—will be the very last to go metric.

Metric Conversion

SI Unit	Symbol	Equivalent
kilogram	1 kg =	32.150 747 troy ounces
453.592 644 9 g	=	1 avoirdupois pound

Troy Conversion

7000 troy grains	=	1 avoirdupois pound
480 troy grains	=	1 troy ounce
1 troy grain	=	64.79891 mg.
1 troy ounce	=	480 grains
	=	$\frac{480 \text{ pound}}{7000 \text{ avoirdupois}}$
1 troy ounce	=	20 pennyweights
1 troy ounce	=	31.103 49 g

n.b. a troy ounce is heavier than an ounce avoirdupois, by about 9 per cent. 1 Troy ounce is equal to about 1.0971 ounces avoirdupois.

1 Short ton	equals 29,166.6 troy ounces
1 Long ton	equals 32,666.6 troy ounces
1 Metric ton	equals 32,150.7 troy ounces

Kilo bar (1.00 kg.): 32.15 Troy ounce bar of fine gold.

Pennyweight: 1.555 g. (24 Troy grains, or one-twentieth of a Troy ounce).

Tael bar: used in the Far East, normally of one, five or ten tael units—the tael being a Far Eastern (Chinese/Malayan) unit equal to 37.7994 g. ($1^{1}/_{3}$ ounce avoirdupois).

"Tola bars". 10-tola bars of precious metals are used in the Middle and Far East, weighing 116.00 g. (3.73 Troy ounces).

Grade of Ore

1 troy ounce per long ton equals 30.612 2 grams per metric ton

1 troy ounce per short ton equals 34.3 ppm (parts per million)

1 gram per metric ton equals 0.032 666 troy ounce per long ton

EXECUTIVE SUMMARY

THE OBJECTIVE OF ONTARIO MINERAL POLICY

THE GOVERNMENT OF ONTARIO IS COMMITTED TO THE OBJECTIVE OF SECURING FOR THE PEOPLE OF ONTARIO THE MAXIMUM ECONOMIC BENEFIT FROM ONTARIO'S MINERAL RESOURCES IN TERMS OF JOBS AND INCOME THROUGH THE INVESTMENT OF PRIVATE CAPITAL IN A HEALTHY AND GROWING MINERAL SECTOR

The Province's mineral policy thrust is generally directed towards:

i) MAINTAINING ONTARIO'S LEVEL OF MINE PRODUCTION THROUGH THE ENCOURAGEMENT OF PRIVATE-SECTOR INVESTMENT IN EXPLORATION AND MINE DEVELOPMENT AND

ii) INCREASING THE LEVEL OF REFINED PRODUCTION IN ONTARIO BY ENHANCING THE INVESTMENT CLIMATE IN ONTARIO.

The aims of the Province's mineral policy are in harmony with some of the federal policy objectives such as

"STRENGTHEN THE CONTRIBUTION OF MINERALS TO REGIONAL DEVELOPMENT".

MINERAL POLICIES AND OTHER POLICIES IMPACTING ON THE MINERAL SECTOR, BOTH FEDERAL AND PROVINCIAL SHOULD BE STABLE OVER THE LONG-TERM AND SHOULD NOT BE SUBJECTED TO YEAR-TO-YEAR BUDGETARY MODIFICATIONS IF INVESTMENT IN EXPLORATION AND MINERAL DEVELOPMENT IS TO BE MAINTAINED AT ITS PRESENT LEVEL, LET ALONE INCREASED.

If government policies are to be formulated effectively, a thorough, in-depth understanding of the relationships between the Ontario mineral industry and the world market on the one hand, and between the Ontario Government and the Ontario mining industry on the other, is of vital importance.

IT MUST BE EMPHASIZED THAT GOVERNMENT POLICIES CAN BE EFFECTIVELY DIRECTED ONLY TOWARDS THE RATHER LIMITED REDUCTION OF COSTS, RISKS AND UNCERTAINTIES.

There are problems over which the governments of most mine output countries have no control, such as commodity prices and worldwide cyclical movements.

Since the revenues from metal sales at world prices are consequently beyond Ontario Government control policy can be aimed only at the reduction of costs and risks.

THE GOVERNMENT OF ONTARIO CAN BE MOST EFFECTIVE IN ALTERING SUCH AREAS AS PROVINCIAL TAXES, REGULATORY DELAYS, ENVIRONMENTAL STANDARDS AND HEALTH AND SAFETY REGULATIONS FOR TAX LEGISLATION TO BE EFFECTIVE. OTHER PROVINCIAL POLICIES REGARDING LABOUR SUPPLY, INFRASTRUCTURE AND ENVIRONMENTAL PROTECTION SHOULD BE STRUCTURED SO AS TO COMPLEMENT THE OBJECTIVES RATHER THAN CONFLICT WITH THEM.

WORLDWIDE INFLATION AND UNDULY STRICT ENVIRONMENTAL STANDARDS SERIOUSLY INTERFERE WITH ATTAINING A HEALTHY LEVEL OF PROFITABILITY. IN PARTICULAR, THE PLANNING AND FINANCING OF NEW MINES REQUIRE A STABLE TAX ENVIRONMENT FREE OF POLITICAL UNCERTAINTY, OR AN EQUIVALENT RAPID RETURN OF CAPITAL.

STATEMENT OF THE ISSUES

If government policies are to be formulated effectively, a thorough understanding of the relationships between the Ontario gold mining industry and the world market on the one hand and the Ontario government and the gold mining industry on the other, is vital.

This report is an attempt to outline Ontario's position in a worldwide perspective and to achieve a level of awareness and understanding by the public that will aid in the formulation of effective metal minerals policies for this province.

Ontario's Position

Canada is the *world's third largest mine source*, (after Russia and South Africa), of gold. Ontario is by far the largest mine producer of gold among the Provinces.

Ontario has been a significant producer of gold over the past 50 years. For many years, Ontario has been Canada's leading mine producer of gold. Mine output of bullion gold in Ontario in 1980 was $388 million in value. TOTAL ONTARIO MINE PRODUCTION VALUE OF PRECIOUS METALS WAS $900 MILLION IN 1980, OR OVER 23 PER CENT OF THE VALUE OF ALL METAL MINE OUTPUT IN THE PROVINCE THAT YEAR.

In 1980, a new gold rush started in Ontario and this continues in 1981. This development is the resurgence of individual speculation and risk taking.

The effect of recent price increases for gold and the other precious metals—in U.S. dollars—has been to add considerably to the dollars returned to Canada for the precious metals.

The U.S.A., Western Europe and Japan account for the bulk of world gold consumption in industry and the arts. Canada has a relatively small consumption of gold, 8 tons per annum, (compared to its mine production of 48 tons). The export of surplus gold from Ontario greatly helps the economy and the balance of payments.

Gold is essential to modern technology, for electronics, for a better standard of living, etc. and gold may experience significant growth in demand as a result, quite apart from the increasing investment-hoarding demand.

Ontario is in the process of becoming an even more important gold producer on the world scene as new, more economic deposits are being developed in Ontario and as new discoveries come into production.

The most important point to grasp is that South African mine production of gold will decline significantly from 1987. Production from the other major producing countries such as Brazil and China and Soviet sales of gold to the West cannot be expected to fill the gap, on present evidence. There is a proven need for gold as a vehicle for world trade, especially in the trade in food grains with the Eastern Bloc.

The gold price should therefore strengthen in real terms during the 1980's which could then further stimulate exploration in Ontario.

With very little effort or support, Ontario could reinforce this momentum to find and make new gold mines in Ontario. The benefit in terms of trade and jobs and tax revenue is obvious and immediate, but especially important is the fact that such an exploration boom will discover economic deposits of other metals and that the development of these deposits could sustain the pace of development in Northern Ontario for 20 years. Such measures as Custom Gold Mills, more favourable terms for mobilising risk capital on the Toronto Stock Exchange and support for roads and other infrastructure may be all that is necessary.

CONCLUSIONS

1) THE WORLD'S TOTAL OUTPUT OF NEWLY MINED GOLD WILL INEVITABLY DECLINE AS SOUTH AFRICA'S PRODUCTION SHRINKS AFTER 1987. GOLD PRICES WILL RISE FURTHER—QUITE DRAMATICALLY. IF REAL GOLD PRICE INCREASES DEVELOP AFTER 1985, AS EXPECTED, EXPLORATION IN ONTARIO SHOULD INCREASE. A VALUABLE SPIN-OFF WILL BE THE INCIDENTAL DISCOVERY OF OTHER METALS IN THIS EXPLORATION EFFORT.

2) IN THE INTERIM, MUCH MORE EXPLORATION FOR GOLD IS NEEDED IN ONTARIO AND THE GOVERNMENT SHOULD ASSIST IN THIS EFFORT. THIS SITUATION CONSTITUTES AN EXCELLENT OPPORTUNITY TO PROVIDE AN INCENTIVE TO INCREASE ONTARIO'S GOLD OUTPUT AND POSSIBLY LEAD TO THE DISCOVERY OF OTHER MAJOR BASE METAL DEPOSITS IN ONTARIO.

3) NEWLY MINED GOLD IS AN INSTANT CASH CROP FOR ONTARIO AND CANADA. IT CAN ALWAYS BE SOLD PROMPTLY, (FOR A PRICE), UNLIKE MANY OTHER METALS. THERE IS NO SUCH THING AS A MINE PRODUCER OF GOLD SITTING ON AN INVENTORY OF GOLD WHICH HE CANNOT SELL.

4) THE GOVERNMENT COULD INCREASE ASSISTANCE IN THE FINANCING OF SMALL CUSTOM GOLD MILLS ACROSS NORTHERN ONTARIO, THROUGH B.I.L.D. OR A SIMILAR PROGRAM, TO TREAT THE OUTPUT OF THE MANY SMALL HIGH GRADE GOLD DEPOSITS—WHICH WOULD OTHERWISE BE UNECONOMIC—BY MEANS OF MORE CAPITAL GRANTS INCENTIVES. EIGHT SUCH MILLS COULD RESULT IN AN ESTIMATED 200 NEW JOBS IN NORTHERN ONTARIO AND ANNUAL REVENUE OF SOME $40 MILLION, IF GOLD IS VALUED AT U.S.$500 AN OUNCE. AN IMMEDIATE RESPONSE AND A SUBSEQUENT INCREASE IN GOLD OUTPUT COULD BE EXPECTED.

5) THE GOVERNMENT COULD ENCOURAGE OTHER CUSTOM AND TOLL REFINING WORK, USING PRECIOUS METAL SCRAP AS FEED. ONE INCENTIVE MIGHT BE TO STUDY THE ALLOWANCE OF THE DEDUCTION OF SUCH TOLL COSTS IN DETERMINING THE ONTARIO MINING TAX PAYABLE BY AN INTEGRATED MINE PRODUCER. THIS COULD INCLUDE CUSTOM OR TOLL CONCENTRATING, SMELTING AND REFINING OF CONCENTRATES, SLUDGES, SLIMES, SCRAP AND OTHER RAW MATERIALS. AT PRESENT, THE INTEGRATED MINE PRODUCERS OWNING AND OPERATING THEIR OWN SMELTER/REFINERIES CAN DEDUCT, UNDER THE MINING TAX, ONLY THE COSTS OF REFINING THOSE PRECIOUS METALS WHICH COME FROM THEIR OWN MINES. SECONDARY REFINERS CAN DEDUCT NOTHING SINCE THEY OWN NO MINES.

6) THE GOVERNMENT COULD STUDY THE AWARD OF SPECIAL GRANTS OR TAX CREDITS FOR ENVIRONMENTAL EQUIPMENT INVESTMENT BY MINES IN ONTARIO PRODUCING GOLD.

7) THE GOVERNMENT COULD PRESS THE VARIOUS AGENCIES FOR MORE FAVOURABLE TERMS FOR MOBILISING RISK CAPITAL FOR JUNIOR MINING MINERAL EXPLORATION IN ONTARIO.

POLICY PROPOSAL

RECOMMENDATIONS

IT IS RECOMMENDED THAT THE GOVERNMENT

1) INCREASE ITS ENCOURAGEMENT OF MINERAL EXPLORATION IN ONTARIO FOR THE PRECIOUS METALS SUCH AS GOLD. THE ONTARIO MINING TAX SHOULD BE ADJUSTED SO THAT IT PROVIDES A 33 1/3 PER CENT INVESTMENT ALLOWANCE FOR MINERAL EXPLORATION EXPENDITURES, OR A HIGHER ALLOWANCE IF DEEP DRILLING IS DONE, MAKING ONTARIO'S PROVISION COMPARABLE TO THAT OF ITS NEIGHBOURING PROVINCE, QUEBEC. CANADA IS THE WORLD'S THIRD LARGEST SOURCE OF NEWLY MINED GOLD AND ONTARIO IS BY FAR THE LARGEST MINE PRODUCER AMONG THE PROVINCES AND COULD PRODUCE MORE. ONTARIO ALONE RANKS AS THE FIFTH OR SIXTH JURISDICTION IN WORLD GOLD OUTPUT.

2) RECOGNISE THE COSTS OF THE CUSTOM TREATMENT OF GOLD-BEARING SCRAP AT REFINERIES IN ONTARIO OF THE INTEGRATED MINE PRODUCERS IN CALCULATING THE ANNUAL ONTARIO MINING TAX.

3) INCREASE THE GRANTS AND TAX CREDITS IN O.M.E.P., (ONTARIO MINERAL EXPLORATION PROGRAM).

4) INCREASE ASSISTANCE FOR CUSTOM GOLD MILLS IN NORTHERN ONTARIO UNDER THE B.I.L.D. PROGRAM.

5) PRESS THE APPROPRIATE AGENCIES FOR IMPROVED TERMS FOR THE PUBLIC RAISING OF RISK CAPITAL FOR EXPLORATION FOR MINERALS IN ONTARIO.

6) INCREASE THE SUPPORT FOR NEW ROADS TO DEVELOP NEW GOLD FINDS, AS WELL AS OTHER INFRASTRUCTURE.

7) STUDY THE POSSIBLE AWARD OF TAX CREDITS OR GRANTS FOR ENVIRONMENTAL EQUIPMENT INVESTMENT.

8) REQUEST THE FEDERAL GOVERNMENT TO STUDY THE REMOVAL OR REDUCTION OF THE CAPITAL GAINS TAX IN THE CASE OF RISK CAPITAL VENTURES IN MINERAL EXPLORATION. IT IS WIDELY FELT THAT THIS SINGLE ACTION WOULD CAUSE INVESTMENT IN THE MINING INDUSTRY TO ACCELERATE DRAMATICALLY, BRINGING A STREAM OF BENEFITS TO THE PROVINCE.

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